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The Retail Dealer and Appliance Sales

Interesting although not unexpected results have been obtained from the canvass conducted by the *Electrical World* to secure the views of retail electrical-supply dealers concerning present trade conditions in the sale of electric-heating devices. This inquiry, a detailed account of which is given on another page, follows the similar canvass recently carried out among the central stations of the country and reported on page 1183 of our issue of Dec. 7, 1912. Among the dealers, as elsewhere, the flatiron is unmistakably recognized as the most popular and satisfactory device marketed, in the second class, several laps behind, being included toasters, percolators, stoves, radiators, etc. Many retail dealers complain bitterly about the cut-price competition in apparatus sales due to central stations selling at or below cost to further the use of their service. The justice of the dealer's plea cannot be denied, and the central station should also consider whether it may not injure its own case by reckless pursuance of so unsubstantial a policy. Although dealers have undoubtedly profited from the general advertising done by manufacturers, central stations and themselves as well, the answers to the questions show that this benefit has been confined chiefly to creating interest in and demand for the general class of device advertised without respect to individual brands. His interest aroused, the prospective customer comes to the store and asks for simply "an electric iron" in 75 per cent of the cases noted, allowing the dealer to recommend and select the device finally purchased. In this connection it is of interest that about one-third of the dealers reporting carry only a single line, while nearly all the rest handle several makes. After considering the results of the present inquiry, one cannot fail to accord the retail dealer his deserved important place in the distribution of electric-heating appliances. Enjoying as he does the full confidence of the consumer, the dealer has every reason, if he will but "go after the business," to make himself the real factor in electric-appliance distribution and so lift the burden from shoulders less adapted to carry it, but which have done so thus far and capably.

The Control of Navigable Streams

Two bills dealing with the control of navigable waters now pending in Congress are far-reaching in their effect, especially as regards the relative rights of the states and the federal government to the waters of navigable streams. In the Connecticut River bill in particular, the national government assumes the right to impose a charge for the use of surplus water not needed for purposes of navigation, even where the improvement in navigation has been effected without governmental expenditure. The bill is peculiar in that a private agency is utilized to construct a dam in aid of navigation, and in consideration therefor receives the use of the incidental water-power thereby created, but is required also to pay the federal government a yearly rental depending on the profits. The bill drafted to take the place of the Burton act regulating the diversion of water in the Niagara River is more limiting in its provisions than the act it is intended to supersede. Both bills have been attacked by adherents of the doctrine of state rights, the former on the ground that it confiscates a natural resource of the State of Connecticut, and the latter on the ground that, having agreed by treaty that 20,000 cu. ft. of water per second may be diverted from the American side of the Niagara River without interfering with navigation or with the flow of the stream, the national government has exercised the only prerogative it possesses in the matter and cannot regulate the distribution of the water without invading the property rights of the riparian owners. It is contended in the first instance that the State of Connecticut owns the water and the bed of the Connecticut River at Windsor Locks and that the federal government, having no proprietary interest in the water-power of the river, has no moral or legal ground to demand compensation in any form for the use of the water-power in the river. The national government for some years has taken complete charge of streams and it is claimed that in doing so it has disregarded the rights of the states. The Senate now has a committee considering the legitimacy of such practice on the part of the federal government, but until the Supreme Court passes on a concrete case the attempt at dual control will always tend to produce chaos.

Getting Rental Property Wired

Among all the difficulties of getting old houses wired for electricity, the central-station commercial man's problem really becomes acute when he tackles the rented dwelling. The tenant, of course, in most cases welcomes electric light; but the landlord usually remains obdurate when asked to invest from $25 to $75 additional in property from which he expects no increase of return. It was an astute contract agent who hit upon the scheme of getting the tenant's agreement to pay from 50 cents to $1 more per month, provided the landlord would wire the premises. With this offer, cheerfully acquiesced in, the central station could approach the owner, showing him that the $6 to $12 yearly increase in rental allowed liberal interest on the small investment involved in the wiring, besides leaving a surplus to retire the principal in the course of a few years. The property was thus left with a permanent improvement, worth as a real-estate increment several times the actual outlay, although acquired at no expense whatever to the owner.

Matter and Electricity

Advocates of the electronic theory, which has already afforded so many interesting explanations in widely divergent departments of science, will welcome as its crowning proof the news of the experiments by Sir William Ramsay and Professors Collie and Patterson, outlined on a following page, in which the investigators believe that they have produced atoms of the relatively complex and heavy elements helium and neon, either from hydrogen atoms or from the ultimate elemental electrical charges themselves. For several years now the identity of electricity and matter has been strongly indicated by experimental and theoretical observations. In the electronic state, for example, the flying corpuscles combine the attributes of matter, mass, inertia, etc., with marked electromagnetic and electrostatic properties.

Analytically it has already been numerically shown that the electronic charges which, from other evidence, may be believed to make up ponderable matter would exert self-inductive effects on the ether to account exactly for the inertia displayed by familiar masses, so that as far as ordinary molar effects are concerned, we need only consider the electric charges, omitting altogether matter in the ordinary sense. When, for example, the emergency brakes are applied on a railroad train the passengers are tossed against the seats ahead not because of the corporeal weights they possess, but really on account of the self-induction of their constituent atomic charges on the ether! Then there is the interesting electrical explanation of gravitation, first presented in these columns, which, referring gravitational effects to familiar electrical facts, affords a pleasing solution for the laws of the inverse squares, products of the masses and extreme feebleness of this all-pervading force. Cathode discharges and even the familiar table of electrochemical equivalents contribute striking evidence to the electronists' claims. Magnetic effects on the bands of the spectrum again indicate the close connection between electrical forces and the constitution of matter. And in radio-activity we see frequent instances of matter "breaking down" and throwing off sets of rays which, when cornered, turn out to be nothing else than negative and, possibly, positive electricity.

Now the British scientists seem to believe they have gone a step beyond this down-hill process, actually succeeding in building up atoms either by recombination of simpler atoms or from the ultimate electron units of the discharge traversing the tube. Without reverting to the more commonplace view that these atomic newcomers may have been lurking all the time in the interstices of the electrodes or tube walls, or are even broken-down groups detached from the latter atoms, the conception of creating matter by electrical means will still continue to be a pretty large one. From the enormous amounts of energy liberated when radioactive elements decay we gain some estimate of the tremendous quantities of power which would have to be poured into the atomic crucible. A careful statistician has computed that the great Chicago central-station system produces in all only about one pound of electrons per hour. Evidently, then, competition with genesis is not going to pay on a commercial basis! But if the new claims are well based, it may nevertheless be that our two splendid bulwarks, the twin laws of conservation of energy and of matter, will have to be rewritten as a joint statement, asserting that while the sum total of matter and energy is a constant for any system, either manifestation of the primordial *Urstoff* may be drawn upon for conversion into the other form.

Factory-Plant Engineering

Nowhere is the effect of engineering experience better shown than in the design of isolated plants for factory service. Time was when isolated plants were installed in any manner that seemed at the time cheap and convenient, with the usual results of wasteful operation and complaints about the cost of electrical energy. The day of rule-of-thumb and of unwise economy has gone by in such plants, as it has in the larger ones designed for central-station service. An excellent example of the way things are now done is given in an account of a new Detroit installation of this character by Mr. Harry C. Spillman.

There is generally very little of novelty in small plant design, but in every well-planned example there is a chance for at least some features of more than casual interest. In the plant before us two things stand out as conspicuous instances of good sense in engineering. The first is the adoption of absolutely fire-proof construction, so far as anything can be absolutely fire-proof, in the station from floor to roof. In this plant no timber is used, and so far as care and skill can go there should be no interruption of service from fire, a condition too often neglected in plants as small as the ordinary works plant must be. The second point relates to the boiler room, which is designed with the engineering care which makes for low cost of operation. The equipment of water-tube boilers and automatic stokers is installed under a guarantee of 10 lb. evaporation per pound of dry coal of 13,500 heat units. A feed-water meter and coal and ash scales, all regularly used, keep the plant under practically test conditions all the time so that if the plant is operating with poor economy it will be promptly noticed. Steam meters and a CO_2 recorder complete this excellent equipment, scarcely less effective than would be found in the largest central station.

The choice of engines in the plant is also worthy of comment. The desirability of using exhaust steam for heating resulted in the installation of a cross-compound Corliss engine designed for sufficient back pressure to supply steam to the heating system through the winter months. When run at full load non-condensing, but without back pressure, the steam consumption drops to 20 lb. per indicated horsepower, a highly satisfactory figure. The operating conditions seem to have been taken into consideration at every point, and it is worth mentioning that the average power-factor at the switchboard on the heavy mixed load of induction motors and lamps is up to 84 per cent, a figure considerably better than is generally found in a plant of this size. Installations of this sort are object lessons in the desirability of doing things well as a matter of final economy. A poor plant seldom proves to be a safe or desirable investment.

Local Absorption in Radiotelegraphy

The three conclusions which Prof. A. H. Taylor draws from the facts described in his article on page 350 of this issue of the *Electrical World* are of very marked interest and seem to be sufficiently borne out by the experiences of others in the radiotelegraphic field to warrant study. The havoc brought about by reaction of unprotected wireless transmitters upon power and telephone circuits is very strongly impressed upon the memories of many central-plant officials who have been called upon to repair again and again obscure troubles which were finally traced as results of the activities of some innocent but ignorant amateur experimenter in radio signaling. Professor Taylor's suggeston that these are resonant effects is well supported by the fact that he could eliminate them by changing the wave-length of transmission. In practical radio work it has often been noticed that the so-called "static" charging of nearby wires is much more violent for short than for long waves. It has also been found that small alterations in wave-length of the trouble-making transmitter would change the points along wire lines at which sparking or other indicating actions occurred, thus demonstrating quite clearly the existence of stationary waves of current and electromotive force in the affected circuits. The remedy that Professor Taylor finds effective is one that the difficulties of practice have forced upon commercial and other users of radio, so that now it seems standard practice to install protective devices consisting of grounded pairs of fused condensers further safeguarded by shunting air-gaps to prevent puncture.

Absorption by nearby insulated or grounded conductors results in so many apparently contradictory phenomena that the mechanism of its occurrence is little understood. The study of diversion of energy from receiving antennas is so involved with changes of resonant action that to observe either alone is very difficult, and before many safe conclusions can be reached it will be necessary to consider in detail vast quantities of experimental data covering peculiarities attributable to neighboring conducting systems. Solutions of the problems involved find immediate application in operating radio stations, where there has often been brought up the question of whether metallic towers supporting the antenna should be insulated or grounded in order to afford the best results. In a number of stations several independent antennas are installed, and the effect of one on the others is often a source of argumentative discussion. The real difficulty seems to lie in the fact that a number of conditions which by many are assumed to vary independently actually go along hand in hand in such fashion that to alter one means to change the values of all the rest. Thus it is found that for transmitting on some wave-lengths from some stations it is better to insulate the masts, while for others the most vigorous radiation is had when the towers are carefully grounded.

Radiotelegraphic instruments installed on top of high steel-frame buildings have often been found to give results far in advance of those predicted for them. The indications are that the effective antenna height of such stations is that measured from the aerial's center of effective capacity to the level of the earth's surface rather than the shorter distance to the building roof. Just how much this depends upon the location of apparatus upon the upper floor of the building instead of at the street is still a moot question, though the results of Professor Taylor's experiments as well as the high receiving efficiencies of several roof-installed stations point decidedly toward the higher position as the one to be preferred.

Researches in Magnetic Hysteresis

Since iron or steel enters into the construction of almost all electrical machinery and large apparatus, the laws of the loss of energy in the cyclical magnetism of iron and steel are of great practical importance. The process is, however, essentially complex, since the magnetic flux density in iron or steel is no simple linear function of the magnetizing force, but, as is well known, follows a saturation curve. Moreover, in the measurement of the hysteretic power loss we are confronted with certain difficulties, whether we select the ballistic or the alternating-current method. In the application of the ballistic process we are unable to use a null method, and the galvanometer deflection has to be corrected for damping and other disturbing influences. In the application of the alternating-current method we have to correct for the loss in eddy currents. This correction it is difficult to make with precision.

The law of hysteretic energy loss, announced by Steinmetz in 1890, states that the cyclic loss is proportional to the 1.6th power of the flux density, as deduced from Ewing's ballistic measurements. In 1892 Dr. Steinmetz confirmed the law by alternating-current measurements and extended it to dissymmetrical cyclic magnetization. The Steinmetz exponential coefficient 1.6 has been checked by many observers to a degree of precision sufficient for existing engineering purposes and has taken a permanent place in engineering literature. The question has, however, often been raised as to whether it is an empirical coefficient that represents the facts to a first approximation or whether it expresses a true physical law. Many physicists report observations tending to show that the coefficient is not strictly 1.6, but varies slightly in different samples of steel, and also in different ranges of flux density in the same sample. No satisfactorily simple expression of the true law has, however, yet been offered.

A recent contribution to the literature of magnetic hysteretic energy loss, referred to in our *Digest,* has been published by Dr. Fritz Holm, in the form of a doctorate thesis. He employed both the ballistic and the alternating-current method. He found that with symmetric magnetization—that is, equal plus and minus flux densities in the cycle—the exponential coefficient 1.6 is fairly well maintained, but that when dissymmetrical magnetization is used, by superposing cyclical upon unidirectional magnetization, the exponent is considerably altered, the energy loss for a given cyclic range in flux density being greater at high mean densities than at low mean densities. The question of the accuracy of the exponent 1.6 from the standpoint of physics is thus freely open to doubt, although from the standpoint of engineering it is not yet debatable. It remains to be determined by the physicist what the strict expression is.

The News of the Week

Activities and Events in the Electrical Field—Reports of Meetings—Commission Findings, Etc.

Railway and Light Conference on Public Policy

The public policy committee of the National Electric Light Association, through its chairman, Mr. Arthur Williams, has invited the committee on public relations of the American Electric Railway Association to dine at the Union League Club, New York, on Feb. 18, for the purpose of discussing methods of bringing about closer relationships between the two great national bodies in matters pertaining to public policy. The committee of the American Electric Railway Association comprises Mr. Thomas N. McCarter, president of the Public Service Railway Company, Newark, N. J., chairman, and Messrs. Patrick Calhoun, president of the United Railroads of San Francisco; O. T. Crosby, formerly president of the Wilmington (Del.) & Philadelphia Traction Company; James H. McGraw, president of the McGraw Publishing Company, and William H. Heulings, Jr., assistant secretary of The J. G. Brill Company and president of the American Electric Railway Manufacturers' Association. Much of the work of the two committees covers common ground, and it is felt that the interchange of viewpoints between the prominent men of the railway and of the lighting industry will redound to the credit of both and result in joint action and recommendations on questions of great importance.

Electrical Supply Jobbers at Buffalo

At the quarterly meeting of the Electrical Supply Jobbers' Association, held at Buffalo, N. Y., Tuesday, Wednesday and Thursday of this week, there were 350 registrations at the Hotel Lafayette headquarters. Other hotels housed a number of electrical men who did not find accommodations at the Lafayette.

Mr. F. S. Price, of the Pettingell-Andrews Company, Boston, was elected chairman of the Atlantic Division, and Mr. N. G. Harvey, general manager of the Illinois Electric Company, chairman of the Central Division. Mr. Franklin Overbagh, general secretary of the association, was elected to serve as secretary and treasurer.

Discussion at Wednesday's general session developed the fact that a large majority of the jobbers present were opposed to any changes in the present code provisions relating to fuses. This attitude on the part of the jobbers was brought out in connection with the necessity for defining what their action would be at next month's meeting of the National Board of Fire Underwriters, when the refillable-fuse question, among others affecting electrical material, will be taken up.

As reported by members, the average cost of doing business in 1912 was 16.5 per cent of the gross income, an increase of 0.5 per cent over 1911. May 26, 27 and 28 and Chicago are the time and place determined upon for the next meeting of the association.

Tuesday evening a large number of Jovians attending the convention witnessed a rejuvenation by the Buffalo chapter of their order. The work of initiation was elaborately staged in a local Scottish Rite chapel and impressively carried out by the officiating team, thirty-seven candidates being admitted. Later in the evening a rejuvenation supper, enlivened by a cabaret performance, was attended by several hundred local and visiting Jovians.

Another social event of the meeting was the Lincoln Day dinner, at which Mr. Wallace and Mr. Tonkin, on behalf of the Ansonia Electric Company, entertained a number of the company's branch managers and special agents.

Government Telegraph Ownership Recommended by Postmaster-General

Postmaster-General Hitchcock in his annual report, transmitted to Congress on Feb. 11, again recommends government ownership or control of telegraph lines. Mr. Hitchcock says: "In the last annual report the opinion was expressed that telegraph lines in the United States should be made a part of the postal system and operated in conjunction with the mail service. It is believed that under proper management such a consolidation would result in important economies and permit adoption of lower telegraph rates. Now that a postal savings system has been established and a parcel post provided for, there would seem to be no better opportunity for the profitable extension of our postal business than through the adoption of a government telegraph system."

Production of Complex Atoms from Simpler Ones or from Ultimate Electrons

The liveliest scientific interest has been aroused by the remarkable experiments reported before the Chemical Society at London on Feb. 6 by Sir William Ramsay and Profs. Norman Collie and H. Patterson. Subjecting to cathode rays certain discharge tubes containing only hydrogen at low pressure, the investigators found, following the passage of the discharges, evidences of the rare gases neon and helium present with the hydrogen.

Since every precaution had been taken to exclude any foreign gas from the tubes, the presence of the new elements is to be accounted for by derivation in one of the three following ways: First, breaking up of the hydrogen atoms (atomic weight 1) into their constituent electrons under the cathode bombardment, and recombination of these electrons to form the heavier and more complex atoms of helium (4) and neon (20); second, separation of electronic groups from the glass walls or the aluminum and gold electrodes of the discharge tubes, these groups becoming at once, or combining to form, helium and neon atoms; third, production of the new elements directly from the free electrons of the electric current traversing the tube, indicating the actual creation of ponderable matter from the electrical energy of the discharge.

If either the first or third of these explanations be the correct one, experimental evidence is afforded for the first time that complex atoms can be built up out of simpler ones, or, indeed, from the ultimate electrical charges. For several years, of course, it has been well known that the heavy elements like radium, uranium, polonium, thorium, etc., degrade into elements of lower atomic weight with the production of relatively prodigious amounts of energy. The reversal of this transmutation, or the production of complex atoms from light ones, was accordingly expected to be outside of physical limitations imposed by the generation of energy on the scale necessary to bring about the

change, although it now seems likely that the cathode bombardment mentioned supplied the intensity of energy required. If, on the other hand, however, the helium and neon groups are due to the breaking down of the heavier atoms contained in the electrodes or tube walls, the experiments still afford valuable data concerning the degradation of other elements besides the ones already known to be subject to this action.

In a cable interview, Sir Oliver Lodge is quoted as assuming a conservative position concerning the interpretation of the new experiments. This distinguished scientist calls attention to the fact that a very large quantity of gas can long remain occluded in the pores of aluminum electrodes, like those used in the experiments, and that this gas when driven out under the stimulus of cathode excitation may appear to be manufactured, although actually only a reserve supply. Sir J. J. Thomson is declared to incline to the belief that the glass of the experimenters' tubes was the source of the helium and neon observed, pointing out that in his own experiments he discovered the production of similar gases during the first few days' run of the tests, following which the effects ceased unless a new glass tube was substituted.

Electric Service for Suburban Districts

At the meeting of the St. Louis League of Electrical Interests, Jovian Chapter, held Feb. 11, Mr. S. H. Wallace, manager of the Suburban Light & Power Company of St. Louis, presented a paper discussing the supply of electric service to suburban districts. The speaker traced the history and development of his company's system, describing in detail the construction and methods employed, use of automatic regulators, etc. The growth of the Suburban company's service is exemplified, he pointed out, in the increase of the peak load from about 40 kw in 1901 to 1800 kw at the present time. On one of the substations, owing to motor load, this peak occurs at 10 a. m.

Annual Meeting of the Electric Club of Chicago

The annual meeting of the Electric Club of Chicago was held on Feb. 6. Reports were received from the outgoing officers and the new officers were installed. Mr. W. M. Connelly, the secretary, reported that thirty-seven regular meetings of the club had been held during the year ended Feb. 1, 1913. At twenty-six meetings speakers were provided. The average attendance was sixty-two, the number of club members in good standing at the present time being 366.

Treasurer John R. Harmon reported that the club's financial resources consist of $3,000 in bonds of the Commonwealth Edison Company and $752 cash in bank. Mr. H. G. Hafner reported for the entertainment committee.. Officers were elected as follows: President, Mr. George C. Keech, Cooper Hewitt Electric Company; vice-president, Mr. William E. Keily, *Electrical World;* secretary, Mr. Fred M. Rosseland, General Electric Company; treasurer, Mr. Charles W. Forbrich, *Electrical Review and Western Electrician;* managers (in addition to officers named), Messrs. John R. Harmon, Sanitary District; William W. Hincher, Albert & J. M. Anderson Manufacturing Company; George Markham, Chicago Telephone Company; A. Balsley, Commonwealth Edison Company; H. M. Webber, Chicago Telephone Company.

In laying down the president's gavel Mr. A. A. Gray spoke in especially commendatory terms of the work of Secretary Connelly and Treasurer Harmon. Mr. Keech, the new president, made a brief address in which he announced that the members of the club would be divided into two equal divisions to take part in a contest to secure new members. The divisions will vie with other in this endeavor, and the result will be announced from week to week. It is expected that by this means the membership of the club will be raised to the limit of 500. Mr. Keech also said that the club would probably offer its services in connection with the plans for the entertainment of the National Electric Light Association during the June convention of that body in Chicago. He announced committee chairmanships as follows: Membership, Mr. Balsley; attendance, Mr. Hincher; house, Mr. Webber; reception, Mr. Harmon; speakers, Mr. B. E. Blanchard; entertainment, Mr. Markham.

Testimonial to Mr. W. W. Freeman

As a mark of their esteem and affection for Mr. W. W. Freeman, who retired on Dec. 31, 1912, from the management of the Edison Electric Illuminating Company of Brooklyn after twenty-three years of association with it to become identified with the Alabama Interstate Power Company, the employees of the Brooklyn company presented him with a silver service on the evening of Feb. 10.

The presentation was made at the regular meeting of the Brooklyn Company Section of the National Electric Light Association, prior to which the members of the staff council of the company, with the officers and committees of the section, gave a dinner to Mr. Freeman and to Mr. William J. Burns, the famous detective, who later on gave a two-hour talk to the employees of the company.

SILVER SERVICE PRESENTED TO MR. FREEMAN

Mr. W. F. Wells, the present general manager of the company, was to have made the presentation speech to Mr. Freeman, but on account of a death in his immediate family was unable to be present, and Mr. E. A. Baily, who was Mr. Freeman's secretary and is now secretary to the latter's successor, was called upon to make the address. Mr. Baily paid a high compliment to Mr. Freeman's ability as shown in his rising from the position of stenographer to that of vice-president and general manager of the company. He also spoke of the heavy debt of gratitude the employees of the company are under to Mr. Freeman in connection with the various profit-sharing, pension and other welfare plans which he placed in operation.

The silver service bears an inscription indicating the date and circumstance of its presentation, followed by these lines:

> "Honor and reverence and the good repute
> That follows faithful service as its fruit
> Be unto him whom living we salute."

Mr. Freeman, in responding, expressed his appreciation of the gift and the feeling which accompanied it.

Discussion of Municipal Lighting by I. E. S. and Municipal Art Society

At a meeting of the Illuminating Engineering Society held jointly with the Municipal Art Society in the galleries of the National Arts Club at 119 East Nineteenth Street, New York, on Feb. 12, a paper was presented by Mr. C. F. LaCombe, chief engineer of the Department of Water Supply, Gas and Electricity of the City of New York. The title of the paper was "Municipal Lighting" and particular attention was paid to the street lighting and fixtures, to lighting of municipal buildings and to illumination from electric advertising signs. The speaker described the lighting of the streets of the city as it was a few years ago and then told of the improvements that have been made and are now being planned. The lecture was illustrated with lantern slides showing fixtures as they formerly existed and contrasted them with the ones in use at present. The speaker stated that there are at present in operation in the borough of Manhattan more than 83,000 street lamps whose total candle-power aggregates approximately 15,000,000. The talk was closed with an appeal for the persistent co-operation of the artist and the illuminating engineer and the furtherance of the artistic features in fixture design.

The meeting was also addressed by Mr. Arthur Williams, general inspector for the New York Edison Company; Mr. William Wentz, of the O. J. Gude Advertising Company, and Mr. Charles Roland Lamb, ecclesiastical architect.

Mr. Williams spoke of the value of street lighting and in quoting an eminent authority stated that one arc lamp was the equal of two policemen in rendering the highways of a city safe for pedestrians.

Mr. Wentz followed the career of the electric advertising sign from the time that the first advertisment of this kind was placed on Broadway up to the present day, and described the Great White Way as it now appears illuminated with mammoth flashing signs.

Mr. Lamb spoke of the beautiful lighting effects produced in the city at the time of the Hudson-Fulton celebration and showed a number of lantern slides.

The meeting was preceded by a dinner at the National Arts Club.

A School to Teach the Selling of Electricity

A school that is probably unique has just been established in Chicago, having been incorporated under the laws of Illinois. It is called the Chicago Central Station Institute, and it is supported by the Commonwealth Edison Company, Federal Sign System (Electric), Illinois Northern Utilities Company, Middle West Utilities Company and the Public Service Company of Northern Illinois. The purpose of the school is to teach young-men students the commercial side of the electric-service industry. A tuition fee is charged, but the student will give about half of his time to practical work in soliciting business, and for this he will be paid. Mr. E. W. Lloyd, general contract agent of the Commonwealth Edison Company, is president of the Chicago Central Station Institute, and Mr. Fred R. Jenkins, formerly general inspector of the Chicago Edison Company, is the secretary and manager of the new school. The directors are Messrs. Frank J. Baker, John F. Gilchrist, Martin J. Insull, E. W. Lloyd and Charles A. Munroe.

The course of instruction covers eleven months and the purpose of the school is to supply the increasing demand of large electrical companies for trained men in their commercial and selling departments. The tuition is $100 for the full term of eleven months, but for his half-time service in the field it has been arranged to pay the embryo solicitor $40 a month. The offices and classrooms of the new school are at 112 West Adams Street, Chicago. Applicants for admission must be over twenty years of age, of good moral character and physically sound. They must have at least the equivalent of a high-school education and must give their entire time on weekdays to the work of the institute from 8.30 a. m. until 5:30 p. m., except for a half-holiday on Saturday. Upon the satisfactory completion of the full course the graduate will receive a certificate to that effect.

The subjects of study include salesmanship, rates for lighting and motor service, electricity in residences and theaters and on the farm, electric motors and factory lighting, signs and decorative lighting, lamps, electrical construction, electricity for stores, accounting and metering, generating and distribution, and isolated plants.

Among the lecturers will be Messrs. W. L. Abbott, P. P. Bird, O. J. Bushnell, W. A. Durgin, John W. Ferguson, H. B. Gear, John F. Gilchrist, M. S. Hart, O. R. Hogue, Dana H. Howard, George B. Johnson, George Harvey Jones, P. Junkersfeld, E. W. Lloyd, W. D. McJunkin, J. C. Manley, H. I. Markham, W. J. Norton, C. W. Pen Dell and E. O. Schweitzer. Mr. H. L. Lincoln has been engaged as general instructor.

Electric-Vehicle Prospects in Chicago

Lunching together informally, members of the Chicago Section of the Electric Vehicle Association discussed matters of common interest at the meeting of Feb. 4. Mr. George Harvey Jones, chairman of the section, who recently returned from the Pacific Coast, gave a short account of his observations in California. He said that in Los Angeles a large number of electric passenger cars are in use but not many electric trucks. There would seem to be an opportunity in that city for the use of a much greater number of electric commercial vehicles. Mr. D. C. Arlington, the statistician of the Chicago Section, announced that there are 531 electric commercial vehicles in service or on order in Chicago. Mr. H. E. Niesz told of the location of a new, exclusively electric garage, of which Mr. J. J. O'Brien is proprietor, at 4167 Emerald Avenue. This garage is, perhaps, the first exclusively electric garage to be opened in the industrial region known as the "Stockyards district." It is supplied with electric energy by the Cosmopolitan Electric Company and makes a flat rate of $20 a month for the storage, washing and minor repairs of commercial vehicles. To this is added a charge for electricity figured at 4.5 cents per kw-hr. for the first 300 hours and 4 cents an hour for all subsequent energy consumption during the month. It is believed that this combined rate will make the garage cost of maintaining an average electric truck about $40 or $45 a month.

Mr. James H. Delany, of the Cosmopolitan company, pointed out that there is a great opportunity for extending the use of electric commercial vehicles in the industrial district near the Union Stockyards. The existence of the new garage should make it easier for manufacturers of and dealers in electric trucks to sell their vehicles in the Stockyards district. A discussion followed.

Public Service Electric Company's Educational Campaign

At the regular weekly meeting of the employees' industrial school of the Public Service Electric Company of New Jersey, Jersey City, Feb. 7, Prof. T. Gilbert McFadden, dean of the electrical course in the Industrial and Technical High School of Hudson County, discussed the fundamental physics of electrical generation, supplementing his lecture with laboratory experiments demonstrating the theories of which he spoke. The lecture was illustrated with numerous diagrams and was delivered in non-technical language.

This address was the initial expression of the co-operation which the educational committee of the Public Service

Electric Company has been able to secure from the Hudson County Board of Education. The meeting was, however, the third of a series dealing with subjects pertaining to the generation of gas and electricity and the commercial uses of these two commodities.

Many central-station companies are spending no inconsiderable amount of time and money in educating their salesmen to become more efficient. The Public Service Electric Company has elaborated on this system and extended it to include all the employees of its offices. The men of the accounting and collection departments come into more intimate contact with the public than the men in any other branch of the company's business. It has been the aim of the management to secure the closer co-operation of these men and to show them the adaptations and applications of electricity so that they may act as missionaries to the public with which they deal.

The success with which this plan has been attended is illustrated in point by the fact that at the close of the last meeting two men from the accounting department and one collector presented Mr. T. F. Bludworth, who was presiding at the meeting, with the addresses of prospective customers for an electric washing machine, a coffee percolator and a flatiron.

In addition to providing weekly instruction for the employees, the company is conducting a boys' class in electricity at night school. To this class is eligible one pupil from each school in Hudson County in which a course in physics is available, and it is declared that these future electrical engineers are the best emissaries the central station has yet been able to acquire.

Additional Water-Power for Minneapolis and St. Paul

Active construction work has been commenced on the Coon Creek Rapids development in the Mississippi River, 11 miles northeast of Minneapolis, where a 12,000-hp plant is to be erected by H. M. Byllesby & Company, to furnish additional power to their Minneapolis and St. Paul properties. The dam is being built under a fifty-year permit granted by the United States government, which requires that the army engineers supervise the design, construction and operation of the development.

The dam will consist of an earth embankment with core walls 600 ft. long, power house and retaining section 470 ft. long, including sluice-gates, log chute and fishway, and spillway section 1000 ft. long, making the total length of the structure 2070 ft. This work will involve 20,000 cu. ft. of earth embankment and approximately 45,000 cu. yd. of steel-reinforced concrete.

To secure a suitable and safe foundation, 8000 round wooden piles will be driven down to firm foundation. About 1000 tons of interlocking sheet-steel piling will also be used in lieu of a cut-off wall for retention of water in the reservoir and prevention of under-cutting of the dam. In order to provide for the greatest possible head at all stages of river flow, at the same time preventing excessive flood heights, Tainter gates are to be used for regulating the water level in the reservoir. Twenty-eight of these 33-ft. steel gates, each weighing 12,000 lb., will be erected between reinforced-concrete piers built on the spillway portion of the dam. The fishway, designed in accordance with government requirements, will provide for the free passage of fish up and down stream, and the log sluice will afford a convenient means of passing logs by the dam.

The first installation in the power house will aggregate 12,000 hp, transmitting to Minneapolis at 13,300 volts, thus tying in directly without transformers with the general distribution system of the Minneapolis General Electric Company at its Riverside steam plant. The transmission line to Minneapolis will be erected for part of the distance on private right-of-way and partly alongside the new tracks of the Minneapolis & Northern Railroad.

Within the last three weeks a construction camp has been established at Coon Creek Rapids, accommodation for 400 men being provided. This will be increased later so as to provide for 800 to 1000 men during the spring and summer months. The camp is equipped with its own water supply and sewage system. Following modern methods, a hospital, with a surgeon, trained nurses and attendants, will be available during construction. Matters of water supply, sanitation and policing of the camp will be handled in the same way as if for a modern city. The camp will be lighted by electricity throughout, energy being supplied by the Minneapolis company. Electricity will also be used for driving a considerable portion of the construction plant.

During the construction of the dam there will be distributed for labor and commissary supplies approximately $600,000. The housing and feeding of the men employed on the construction are in themselves an enormous undertaking, in view of the short time allotted for this work and the relatively short period that the camp will be in operation.

Power Negotiations at Westfield, Mass.

Negotiations have been continued between the Amherst Power Company and the Westfield (Mass.) board of electric light commissioners in connection with the proposed supply of electricity to the town from the company's hydroelectric system and the shutting down of the existing municipal steam plant as a regular source of electrical service. A new proposition has been made by the company which will enable the town to lay aside $5,500 per year for depreciation and an additional $6,000 as profit, if the present plant is shut down, upon the basis of a ten-year contract, giving the municipality an annual saving of $11,500 over the present cost of serving the public. The company also proposes to keep the existing steam plant of the town in repair and in running order during the decade, with the privilege of operating it as an auxiliary in case of necessity, all operating costs to be paid by the company. It also agrees to give notice at the end of eight years of the schedule of prices proposed for the following decade. The company is prepared to begin service to Westfield by Sept. 1, in case of a favorable decision by the municipal lighting board, and if the proposition is accepted a transmission line will be built through the Westfield Valley to enable the delivery of energy to be made from a central distributing point.

Extensions to New Haven Single-Phase System

In the accompanying table is shown the increase in single-phase electrification of the New York, New Haven & Hartford Railroad from the beginning of operation in 1907 up to the present date.

NEW YORK, NEW HAVEN & HARTFORD RAILROAD ELECTRIFICATION

	1907	1913
Track electrified, miles	114	552
Power house, hp	21,000	45,000
Number of electric locomotives	41	151
Horse power of electric locomotives	41,000	128,800
Electric locomotive mileage	1,569,645	5,489,656

The recent decision to electrify the division between Boston and Providence will add about 200 miles of track electrification, the proposed territory being a four-track route between Boston and Providence, inclusive of the yards and

sidings necessary to electric movement. The engineering plans for application of the single phase to this territory are practically complete, the actual work of construction being held in abeyance only until indorsement of necessary appropriations to cover the cost.

The New York, New Haven & Hartford Railroad engineering specification for the electrification of the Boston metropolitan district, comprising over 400 miles, is based upon single-phase operation. In addition to the large extensions of the original single-phase electrification of the New Haven system that have been made, others are now in progress, including:

(1) The six-track main-line Harlem River branch, with sidings and yards.

(2) New York, Westchester & Boston two-track and four-track, with sidings and yards.

(3) The extension of the four-track main line to New Haven, with sidings and yards.

(4) Four-track section, Boston-Providence.

All of the above cover passenger, freight and switch operation. The original electrified track mileage of the New Haven system was 114. When the above extensions are completed the total electrified track mileage will be 750.

Power Development for Montpelier District

The Consolidated Lighting Company, of Montpelier, Vt., one of the Tenney companies, has purchased the Molly Falls Light & Power Company, of Marshfield, Vt., and also water rights at Lamberton Mills and Peacham Pond. The Consolidated company is planning to develop about 3000 hp at Molly Falls by raising the level of Peacham Pond about 8 ft., increasing the area by about 100 acres and storing in the basin the flood waters of the spring. The plans include the building of a power house on the site of the present smaller station at Molly Falls and the installation of a pipe line 1.5 miles long to the Lamberton mill, where the existing dam will be rebuilt and the storage capacity increased as outlined above. The power will be utilized in the Barre and Montpelier district in connection with that furnished by the other plants of the company. The headquarters of the Tenney companies are at Boston.

Technical Aid for Judges in Trial of Patent Cases

Clause 79 of the new rules of practice for the courts of equity of the United States, which became effective on Feb. 1, provides that with the concurrence of a majority of the circuit judges for the circuit the district courts may make any other and further rules which do not conflict with those already promulgated by the Supreme Court. Under this authority a number of new rules have been drawn up, one of which provides for the position of "assessor" in patent cases, following the German practice. This new rule is as follows:

"In the trial of a patent cause, whenever in the opinion of the court that cause involves intricate technical or scientific questions of fact, the court will, upon the consent of all parties, appoint some disinterested person skilled in the art to act as assessor, the reasonable fee for whose services shall be a part of the taxable disbursements and enforcible as is a master's fee. Such assessor shall sit with the judge at the hearing of the evidence and shall assist the court in its deliberations upon the cause in such manner as the trial judge may request, and any written opinion rendered by the assessor at the request of the judge shall be a portion of the record on appeal."

It is said that the creation of this new position was foreshadowed in a decision by Judge Hand (*Electrical World*, Oct. 28, 1911, page 1081). The advantages of this plan are obvious and its workings will be followed with interest.

Dissolution of Monopoly in Unpatented Articles

On Feb. 7 an agreed decree was entered by Federal Judge Tuttle at Detroit, Mich, dissolving the so-called boot and shoe last trust, composed of the Krentler-Arnold Hinge Last Company and numerous other last manufacturers with whom it was allied by agreements. It was charged in the government suit against the Krentler-Arnold company that it controlled 75 to 80 per cent of the boot and shoe last business and dominated the entire interstate commerce therein, in violation of law. Instead of manufacturing its patented lasts exclusively, the company issued license agreements to other manufacturers, under which the latter, it is said, agreed to maintain a stipulated schedule of prices.

The purpose of these agreements, it was charged, was to fix arbitrarily and unfairly high prices on both patented and unpatented lasts, the latter forming about 50 per cent of the business. Prices were fixed and unreasonable profits obtained, it was declared, through an organization known as the Cary Club, composed almost exclusively of licensees of the Krentler-Arnold Hinge Last Company.

By the agreed decree, in which the defendants disclaim all intention of violating the Sherman law, they are restrained from continuing the alleged unlawful features of their agreements and from further maintaining the Cary Club.

The decree, in effect, lays down the principle that it is unlawful to tie together patented and unpatented articles so as to fix the price of the unpatented commodity. Neither the government's petition nor the decree questions the right of a patentee to fix the price of a patented last. The government's petition was signed by Attorney-General Wickersham, Mr. James A. Fowler, assistant to the Attorney-General, and Mr. Malcolm A. Coles, special assistant.

Status of Niagara Falls and Connecticut River Bills

The Connecticut River dam bill and the committee on foreign affairs' bill on the control of the waters above Niagara Falls are still awaiting action in Washington, with the probability that both will be voted on this week or early next week. Considerable opposition to both bills has developed, although provision has been made whereby the state governments will regulate the companies affected as to rates, service, etc. The principal opposition to the Connecticut River dam bill appears to be from the far Western States, especially on the provision enabling the government to impose charges on the grantee.

One section of the Niagara Falls bill stipulates that the water must be used to its full or proper standard of efficiency and that if it is not so used the Secretary of War may revoke the permit after giving five years' notice to the company holding the permit. The Niagara Falls Power Company and the Hydraulic Power Company, the two companies involved, both take water above the falls and discharge it at about the same point below the falls. The former generates 11 hp per cubic foot of water per second used and the latter generates 18 hp per cubic foot of water per second used. The Niagara Falls Power Company is the pioneer company and discharges its water through a long tunnel passing under the city and emerging at a point under the passenger bridge spanning the gorge. The Hydraulic Power Company takes water through a canal and simply drops it over the brink below the bridge mentioned to the power house below. Its equipment is newer than that of the Niagara Falls Power Company and its head greater, and if the performance of its equipment is chosen as standard and the provisions of the proposed bill are enforced, it will virtually require the rebuilding of the stations of the Niagara Falls Power Company. It is probable, however, that any attempt to enforce the standard will involve extensive litigation.

Governor Ammons on Colorado's Water-Powers

An attendance of 220 marked the Feb. 6 luncheon of the Colorado Electric Club, when the Hon. E. M. Ammons, Governor of the State, addressed the club on the subject of "The Electrical Development of Colorado." Referring to the undeveloped natural resources in metal mines and agriculture, the speaker urged the need for better utilizing the waters of the State, both in the mountain streams for power purposes and by the electric pumping of wells for irrigation. Such pumping, declared the Governor, often proves to be cheaper than gravity irrigation with long ditches and shallow storages, on account of the latter's limited usefulness and large losses by seepage and evaporation. Governor Ammons assailed the position of the federal government in exacting royalty for the use of state waters because they originate partly on government land. This policy, he declared, discriminates against Colorado by denying it ready development of its resources, although Eastern States have in the past been allowed the greatest freedom. The speaker praised the work of Mr. D. C. Beaman toward a solution of the water-power conservation problem for Colorado's benefit and urged state control of water-power rights.

Government Suit Against Trade Monopoly

The federal Department of Justice filed its third anti-trust suit against the United Shoe Machinery Company at Trenton, N. J., on Feb. 8, alleging monopoly and unfair trade tactics toward the Keighley company. The government's bill asked for the termination of the contract under which the Keighley company gave the United company the exclusive right to lease to shoe manufacturers the in-seam trimming machine, the patent for which the Keighley company holds. A number of individual defendants are also named in the complaint. The government severely arraigned the $25,000,000 United company and charged that it controls more than 99 per cent of the trade. It is alleged, among other things, to have discontinued the sale of all important shoe machinery and put into effect unreasonable and oppressive licenses and restrictions, which shoe manufacturers are compelled to accept in order to do business at all. The company is also accused of acquiring and suppressing valuable patents, and persons assigning patents to the "trust" are said to have been required to agree to transfer for a specified time all their future patents for or inventions of shoe machinery.

There is pending at Boston a civil suit for the dissolution of the shoe machinery company, and one count of indictments returned against its officers for the alleged violation of the Sherman law. The United States Supreme Court recently dismissed other indictments filed against the same defendants.

Nebraska Investigates State Development of Water-Powers

The disposition of 250,000 hydroelectric hp, the possible development of the streams of eastern Nebraska, hangs on the result of an investigation which is now being made by the Nebraska Legislature into the feasibility of a plan by which the State will issue bonds, develop the power and sell the energy to the cities of Omaha, Lincoln, Sioux City and other places along the Missouri River. Under existing laws the Commonwealth has no authority to enter upon this field of work, but advocates of state ownership are urging that the Legislature enact the necessary laws and undertake the development. A bill with that aim in view has been introduced in the Legislature, and a committee is now engaged in making the investigation.

Nebraska does not produce a pound of coal or a gallon of oil, and the development of its water-powers is of vital interest. There is a fall of some 5000 ft. between its western and eastern boundary, and its big rivers are capable of developing large quantities of electricity. Kountze Brothers, bankers, of New York, the Moore syndicate of Detroit and the Babcock-Doherty interests have grants for developing more than 100,000 hp on the Platte River, and the sites are all within transmitting distance of Omaha. Governor Aldrich, however, is opposed to state development, and Prof. G. E. Condra, director of the state conservation work, agrees with him. According to Prof. Condra, the State should grant the power sites to private parties, but should retain supervision over the development. He says that this is the best practical means of securing development without exploitation and sacrifice of the public interest.

Governor Foss to Fight for Utility Legislation in Massachusetts

In an interview with the press on Feb. 8, Governor Foss of Massachusetts expressed his intention of keeping up the fight with the Legislature over the utilities legislation as long as the issue remains. He is opposed to the bill transferring the control of telephone and telegraph companies to the gas and electric light commission and is not enthusiastic over the proposal to investigate the telephone situation by a special commission, on the ground that it would postpone action on the utilities legislation. The Governor insists that what is needed is a single board to supervise all the public-service corporations; uniformity in carrying out the policy of regulating quasi-public corporations is what he seeks. He said that both the railroad commission and the gas and electric light commission have done excellent work; that the trouble is not with the commissions but with the system, which requires the attention of commissioners to routine work that might be done by subordinates. With all matters grouped under a single commission, the board could give its attention to matters of policy, allowing subordinates to carry out its decisions. The commission should, of course, have the machinery to get at the facts, but in the opinion of the Governor, it should sit in a judicial capacity and pass on the facts laid before it.

Louisville Merger Interrupted by Gas Disagreement

Although the recent termination of negotiations between H. M. Byllesby & Company of Chicago and Mayor William O. Head of Louisville, Ky., looking toward a merger of the electric and gas companies in Louisville under Byllesby management is said to have placed a quietus upon the project for some time to come, many persons who are thoroughly conversant with the existing state of affairs in the Gateway City insist that the negotiations would not have gone so far as they did only to be stopped completely by disagreement. It is declared that resumption of the matter may be expected in the immediate future and that the Byllesby merger is even now as certain to go through as it apparently was during the most favorable moments of the conference.

The understanding throughout the negotiations was that the city of Louisville would withdraw its opposition to the consolidation and consequent elimination of utility competition in Louisville if the Byllesby interests would pipe 35-cent gas from the West Virginia fields of the Standard Oil Company according to a tentative offer made by the Chicago capitalists. Mayor Head objected, however, to 50-cent service charges, deposits to guarantee the payment of bills, charges of a dollar for connecting a meter, and other considerations requested by the Byllesby interests in applying for a gas franchise. It is now declared that the merger may be considered unlikely for the remainder of the present administration, or until next November.

Rules of Electric Service in Wisconsin

At the annual meting of the Wisconsin Electrical Association recently held in Milwaukee, as noted in the *Electrical World* of Jan. 25, 1913, a paper was presented by Mr. J. N. Cadby, of the engineering staff of the Railroad Commission, entitled "The Proposed Revision of Standards of Electric Service Now Under Consideration by the Railroad Commission of Wisconsin."

Tentative rules for electric service in Wisconsin have been prepared by the commission, modifying existing rules and adding new ones. These rules were explained by the speaker. They relate chiefly to electricity meters and meter testing, although interruptions to service, voltage fluctuation, compulsory inspection of consumers' lamps, recommendation to customers of the most efficient illuminating service, and manner of making bills, are also included in the proposed new standards.

Mr. Cadby said that the fact that three fatal accidents during the year 1912 were due to contact with guy wires may have had some influence in inducing the commission to propose revised standards. The present standards of service have been in use five years. A few requests have been received for exemption from the rules, principally from small companies, some having only twenty or thirty customers. One of the proposed rules requires meter records only from utilities having more than 250 electricity meters. It is also proposed to lengthen the interval between tests for some classes of service. The speaker remarked that practically half of the meters tested by the commission were large instruments in theaters, mines and factories.

Mr. F. A. Vaughn, of Milwaukee, opened the discussion. He spoke as a member of the meter committee of the National Electric Light Association, advocating co-operation between the different societies in the electrical field and between them and the public-service commission. He told of the work of the N. E. L. A. committee, of its "Metermen's Handbook" and the "Code for Electricity Meters," produced jointly by the N. E. L. A. and the Edison Association. He read comments made by the meter committee of the N. E. L. A. on the tentative rules of the Railroad Commission of Wisconsin. That committee deprecates discrimination between large and small companies.

Rule 24 of the proposed list received considerable attention. It provides that utilities shall inspect in a general way customers' incandescent-lamp installations at least once in two years and give customers reasonable assistance in securing incandescent lamps best adapted to the service furnished. Mr. Vaughn, for the N. E. L. A. meter committee, said that such a rule might involve serious complications unless liberally interpreted. Nevertheless, something of the kind might be accomplished. Speaking personally, Mr. Vaughn urged co-operation with the Illuminating Engineering Society and commended the illuminating primer.

Mr. Wheeler, of Eau Claire, doubted the practicability of Rule 24. Mr. Cadby said that the company's representatives might put stickers on blackened lamps. Customers' lamps might be inspected when the meter is tested. Mr. Winslow said that there is a distinction between the company's offering its services and its compelling the customer to accept its lamp inspection. The rule might be modified so that the inspection would not be compulsory. Mr. M. C. Ewing, of Wausau, thought the inspection should extend to motors and perhaps heating appliances as well as to lamps. The inspector should have some knowledge of illuminating engineering and make a report to his company, this report, in substance, to be transmitted to the customer. Mr. Pamperin thought such a plan would not be feasible for small companies. He also pointed out that the inspection idea dated back to carbon-lamp days and lost much of its force in connection with tungsten-lamp installations. Mr. Korst objected to too much paternalism and said that in any event the company should be obliged to make inspection only where it furnished the lamps.

Rule 21, as proposed, elicited some discussion. It provides for a "referee test" of a consumer's meter by the commission on formal application. Mr. Korst said that the complainant should seek redress from the company first. Mr. Cadby said that as a matter of fact the commission was not asked to make many referee tests. But when application was made to it the consumer would have more confidence in the commission, perhaps, than in the company. Referring again to Rule 24, Mr. Cadby said that perhaps the lamp inspection could be done by solicitors, and that this would create a good impression in the mind of the consumer.

Tariff Hearings on Schedules B and C

The last two issues have contained accounts of the tariff hearings before the ways and means committee of the House of Representatives which had a bearing on the electrical industry. Other features of electrical interest in connection with the hearings are given in the following columns.

Arc Lamp Carbons

Among others, Mr. Hugo Reisinger, of New York, testified on the subject of electric-light carbons. Mr. Reisinger said that the National Carbon Company, by procuring from the Fifty-ninth Congress a practically prohibitory duty on electric-light carbons, battery carbons and brushes, had been able to prevent the importation of low-grade carbons entirely and to control 80 per cent of the output of high-grade carbons, composed chiefly of lampblack or retort carbon. Mr. Reisinger then referred to the hearings in 1908, and said it was not disputed that the carbon business was in the hands of a trust. He also claimed that the National company is making excessive profits, on an inflated capitalization. Under the Dingley tariff the duty was 90 cents per 100 carbons, but this was changed to 65 cents per 100 ft. by the Payne-Aldrich tariff, which, the witness said, was really an increase, because under the former tariff the carbons were 2 ft. to 3 ft. in length. The low grade of carbons, made entirely from petroleum coke, on which the duty is 35 cents per 100 ft., cannot be imported at all, even on the free list, owing to cheaper production in this country. The witness asked that the duty be lowered from 65 cents to 20 cents per 100 ft., equivalent, he said, to about 25 per cent ad valorem. The present rate for carbon electrodes, brushes, plates and disks is 30 per cent ad valorem, and for carbon not specifically provided for, 20 per cent. Mr. Reisinger explained, under cross-examination, that he imports carbons from C. Conradty, of Nuremberg, Germany. There is no trust over there, he stated, but four large competitors, and there is some competition in France also. Domestic carbons for inclosed-arc lamps, the witness said, are sold by the trust at $18 to $24 per 1000, but cost only $7 to $9, compared with imported carbons at $10 to $14 f.o.b. at a European port. In the case of carbons for flaming-arc lamps, 24-in. lengths cost from $30 to $40 per 1000 f.o.b. European port, with a duty of $13 additional; such carbons last but seventeen hours in service, while the duty alone amounts to 2.6 cents per trim.

The Rock Island Battery Company of Cincinnati, through its president, Mr. M. S. Rosenthal, filed a statement asking that crude retort carbon, ground or unground, only 15 per cent or 20 per cent of which is produced at home, be placed on the free list. Domestic production of coal-gas retort carbon is said to be very limited.

President Otto Koch of the Corliss Carbon Company of Bradford, Pa., an independent concern, filed a statement saying that for two years his company had been making carbon brushes exclusively, using petroleum coke, a by-product from near-by oil refineries. Three years ago this product was a drug on the market, together with fuel oil,

another by-product, which then sold for 2 cents per gallon. No profits have yet been realized from the carbon-brush business, and the company finds itself in competition with imported brushes; therefore no reduction in the tariff, in its opinion, should be made and an increase is really warranted.

The National Carbon Company of Cleveland, Ohio, filed an extensive statement, signed by President James Parmelee and General Manager J. S. Crider. Since the last tariff law the advent of a long-burning flaming-arc lamp, using electrodes composed of carbon and other chemicals, has changed the situation. The annual consumption of high-grade carbons is about 40,000,000 pieces, of which the company supplies about half, the remainder coming from Germany and France. These are composed chiefly of lampblack. Its sales from Jan. 1, 1910 to Oct. 31, 1912, were $1,551,932, and the net profit, after charging off depreciation at 5 per cent on buildings and 10 per cent on machinery and tools, was $92,638. In 1909, prior to the present law, the average selling price of ½-in. by 12-in. carbons for inclosed lamps, which constitute over half the consumption, was about $23 per 1000, but the average to-day is about $18.25. Carbons made wholly from petroleum coke are becoming more scarce, since the raw product is less plentiful at home and lampblack is probably cheaper abroad than coke. Any reduction in the tariff was opposed, and a maximum cut of 5 cents per 100 ft. was considered the most that the business can stand. The price of petroleum coke carbons in packages of 1000 ranges from $8.50 to $11.50 per 1000 ft. and for lampblack carbons from $15 to $25.

For many years carbons were made as pure as possible and contained less than one-fourth of 1 per cent of ash. But the flaming-arc lamp, in which the luminous source is primarily the arc itself, instead of the incandescent electrodes, requires electrodes containing chemicals either in the soft core in the center, in the shell or outside of it. Because of the wide range of shapes, weights and grades the prices range from $30 to $160 per 1000 ft. The present duty on lampblack is 25 per cent and on retort carbon 20 per cent, while on some of the ingredient chemicals it is as high as 45 per cent. The following changes were suggested in paragraphs 95 and 96 of the present law:

"95. Beginning with the word 'carbon' strike out balance of paragraph and insert the following :

" 'Unmanufactured carbon, not specially provided for in this section, 20 per cent ad valorem; electrodes for electric furnace, electrolytic and battery purposes, brushes, plates and disks, all of the foregoing composed wholly or in chief value of carbon, 35 per cent ad valorem; if metal plated or having metal attachments, 45 per cent ad valorem.'

"96. After the words '65 cents per 100 ft.,' and before the words 'fiber tubes,' insert the following:

" 'Flaming or luminous arc lamp carbons or arc-lamp electrodes having flame-producing chemicals in the core, on the surface, or mixed homogeneously into the body thereof, or manufactured in such manner that the weight of any materials other than carbon is more than 5 per cent of the total weight, 45 per cent ad valorem.' "

In reply to Mr. Reisinger's testimony the company stated that it makes a complete line of carbon products, including electric-light carbons, flaming-arc carbons, carbon brushes, carbon electrodes, carbon specialties and wet and dry batteries, but alleged that it had less than 50 per cent of the business including petroleum coke carbons, high-grade carbons, flaming-arc carbons, carbon brushes, electrodes and batteries. Twelve alleged competitors in carbon products in this country were named. The National company said that while dry batteries constitute about 60 per cent of its annual sales, it supplies not over 40 per cent of the batteries used. It also named seven leading competitors in the dry-battery business. In addition to Mr. Reisinger, the company named six importers of carbon products. The cost of high-grade carbons for inclosed lamps, said the company in closing, has greatly decreased since it entered the field, and now does not exceed, for the variety chiefly used in street lighting, 75 cents per lamp per year.

ALUMINUM

Asking that aluminum be placed on the free list, Mr. J. P. Bartlett filed a short brief. The aluminum industry was declared to be in the hands practically of one concern, the Aluminum Company of America, which controls substantially all the sources of aluminum in the country. The company was also charged with oppressive commercial methods and practices, as evidenced by the suit filed against it by the federal government and the decree entered. The following statement was offered in reference to the Aluminum Company of America's capitalization and profits:

"That company, starting with a capital of $20,000, increased it to $1,000,000, of which, according to said petition, an additional $10,000 was paid for in cash, $250,000 was to be paid as called for, and $720,000 was estimated value of certain patents, and that its estimated assets were $27,000,000, representing (with a possible exception of $1,000,000) earnings, and including a stock dividend of 500 per cent, or $16,000,000, declared Dec. 15, 1909, besides cash dividends often declared, those in 1910 admittedly being 17 per cent on said $27,000,000."

The company, through its subsidiaries, is said to be also the largest consumer of aluminum, discriminating in favor of its own users against outside purchasers. Large bauxite deposits, the chief raw material in aluminum production, exist abroad and large manufacturers of aluminum in bulk are also situated there. By placing aluminum on the free list a large stimulus will be given to the manufacture of aluminum products at home.

The Aluminum Company of America filed a somewhat extended statement in defense of its operations and the present duty of 7 cents per pound. The mineral bauxite is found in Arkansas, Georgia, Alabama and Tennessee. It requires 6 tons each of bauxite, coal and limestone to make 2 tons of alumina, from which 1 ton of aluminum is made. Alumina is made at East St. Louis, Ill., the point of minimum freight haul for the raw materials. Carbon made from petroleum coke is another important raw material employed. Next to labor, electrical energy is the chief requirement in making aluminum, and the company has large electric smelting plants on the Niagara and St. Lawrence Rivers and is commencing another plant on the Little Tennessee River.

The reduction process is slow and complicated and requires a large investment. While bauxite is plentiful and has a market value of $5 per ton, aluminum in the form of ingot, sheet or wire has a market value of $400 per ton, owing to labor requirements and the large investment, which amounts to $1,500 per ton of product turned out annually. Even the interest amounts to 4½ cents per pound. Petroleum coke is worth about $5 per ton, but the finished carbons cost about $50 per ton. The smelting process is continuous, requiring three daily shifts. Domestic labor is considerably more expensive than the labor obtainable abroad. Freight hauls on raw materials are also much longer in this country than abroad.

Outside of the United States there are fourteen companies manufacturing aluminum, with a capacity of over 100,000,000 lb. per annum, although the foreign consumption in 1911 was but 55 per cent of capacity. Importations to this country have been as follows, in round figures: 1909, 5,140,000 lb.; 1910, 12,340,000 lb.; 1911, 7,690,000 lb.; 1912, at rate of 18,750,000 lb.

There have been no exports of aluminum produced at home, but there have been some exports of partly or completely fabricated products made from imported ingots. The company asked that the present duty be retained. It also stated that it is not a merger or combination, but has built up its own property and business.

Mica

A statement by Mr. W. V. Brown of Asheville, N. C., on behalf of the Asheville Mica Company, was placed in the record. The statement included extended testimony presented before the Senate finance committee in April, 1909, on the conditions in the mica industry. At present mica is on a specific basis of 5 and 10 cents per lb. and 20 per cent ad valorem. The importers, it is expected, will ask for a substantial reduction on pure mica, leaving built-up mica as it is.

Production of mica in the Asheville region has gradually increased, while the 1912 production for the whole country will show an increase over 1911 of possibly 25 per cent. The imported competitive mica comes practically all of it from India, where labor is very cheap.

In respect to changes in wording of the tariff law, the statement said it ought to be clear that cut or closely trimmed mica should pay about twice the specific duty that uncut or roughly trimmed mica pays. Very little built-up mica is imported, but if not protected by a tariff equal to the difference between domestic and foreign labor, the domestic industry, declared the statement, would suffer. The 20 per cent reduction made two years ago was declared to be the maximum cut that can be justified, and it was asked that present duties be left unchanged. The comparison in the accompanying table was offered between production costs at home and in India, on a pound basis.

COMPARATIVE DATA ON PRODUCTION OF MICA

	United States	India
Cost of mining	$0.12	$0.024
Waste in preparation	0.30	0.060
Labor	0.12	0.025
Total	$0.54	$0.109

The average value of imported mica in 1907 was 37 cents per lb. plus a duty of 14 cents, making a total of 51 cents. This refers to the Muscovite species, which is superior to the phlogopite species or Canadian amber.

Ferroalloys

Extended testimony on the subject of ferroalloys and their protection by tariff duties was given by Mr. A. C. Morrison, of New York City. The speaker first asserted that there is no freight protection, even on the heaviest products, since a shipment can be made from Europe to our own interior at less than the rail rate from the port of entry to destination. The opening of the Panama Canal will make the situation still more serious, said Mr. Morrison.

The introduction of the electric furnace has revolutionized metallurgical processes and raised the temperature limit from 3500 deg. Fahr. to nearly 7000 deg. Fahr., making possible many new processes. A single electric furnace will sometimes consume electric energy at the rate of 12,000 hp over long periods, and hence it is imperative to be near a source of cheap hydroelectric energy. The water-powers of Europe are responsible for active foreign competition in this field.

Great emphasis was placed on the low cost per horse-power of hydroelectric development in Norway, because of the high heads and even stream flow. Energy is being delivered at the furnace busbars in Norway for $5 to $8 per hp-year, compared with $16 to $18 at Niagara Falls under old contracts and recent quotations of $20 to $24 both at the Falls and in the South and West. The ferroalloys, produced in electric furnaces, are combinations of rare metals with iron, such as electrosilicon, ferrochrome, ferrotungsten and ferrotitanium, and are used in very small quantities to impart special properties to steel. In 1907 ferrosilicon was $107 per ton, but foreign competition, said the witness, forced the price down to $60, while the present market price is about $70. Mr. Morrison said his interests owned their own water-power at Niagara but purchased it at Kanawha.

An exhaustive brief was next filed with the committee by Mr. E. F. Price, of the Electro-Metallurgical Company, with works at Niagara Falls, Kanawha Falls, W. Va., and Holcomb Rock, Va. It was strongly recommended that the present duties be left unchanged, and in the event of a tariff for revenue 25 per cent ad valorem was asked. A separate paragraph for electric-furnace ferroalloys was also requested.

Public Service Commission News

California Commission

A decision has been rendered on the application of various public utilities for permission to charge less than the published schedule of rates in certain classes of cases. The commission permits deviations for federal and state governments and the political subdivisions thereof, including public institutions; fairs and other public expositions and celebrations; charity as defined in the opinion in this case, and employees.

The commission has rendered a decision providing that a physical connection shall be established between telephone exchanges of unrelated companies in the northern part of the State. The case was brought about upon complaint of the Tehama County Telephone Company and the Glenn County Telephone Company, which alleged a refusal by the Pacific Telephone & Telegraph Company to afford the desired connection for long-distance service. The commission decided that public convenience required that the physical connections should be made, and it put the expense of such connection on the Tehama County Company and the Glenn County Company. It stated that the rates should be the same as are now in force in long-distance service. The commission further ordered that the telephone companies should arrange for a just division among themselves of the rates, tolls and charges, and in case they are unable to reach an agreement on these points the commission will fix such division as it believes to be just.

Massachusetts Commission

In a recent finding reducing the price of gas sold by the Attleboro Gas Light Company from $1.10 to $1 per 1000 cu. ft. the Massachusetts Gas and Electric Light Commission rules that the consumer shares an equity in the accumulated surplus, and presents one of the first discussions of the subject, and perhaps the most important, in the history of public-utility regulation. The board says: "Where in a brief term of years a large percentage of the plant investment appears to have been procured out of profits, or exceptionally large dividends have been declared, a suspicion naturally exists that prices have been unreasonably high, and a belief arises that the consumer has therefore acquired some equitable interest in such surplus. Where a company performs a public service with a proper conception of its public duty, surpluses of this character are not likely to develop. While such surpluses may be due in part to skill in management, they often are due in part to the general growth and prosperity of the community. Such is the case with the Attleboro company."

The board points out that there is a growing recognition that a public-service company is not entitled to a return upon the unearned increment in value of its real estate and that investment out of profits resulting from the growth of the community has similar attributes. "It is difficult," says the board, "to see why the reasonable amount or rate of return based upon the full value of a company's property should not be affected in the same manner by that portion of the investment made from what

may be termed the unearned increment in its profits as by the unearned increment of value in its real estate; in other words, the reasonable rate of return upon a company's entire investment is lower where an appreciable part is derived from the two sources described than where it is entirely derived from the contributions of the shareholders in their payments for its stock." The company's contention that 4 per cent depreciation allowance should be made is not sustained by the board. In view of the well-known long life of cast-iron mains, there seems to be a general consensus of engineering opinion that where such mains are kept in proper repair a depreciation allowance of less than 4 per cent is ample for that part of the company's plant. Liberal provision for renewal of meters condemned or otherwise lost, as well as ordinary repairs, has been provided through operating costs. The price fixed, $1 per 1000 cu. ft., is the lowest thus far set by the board for an output of such moderate size.

Current News and Notes

ALTERNATOR FOR WIRELESS STATION.—Through an error in transcription there appears on page 145 of our issue dated Jan. 18 the statement that a 200-hp Westinghouse synchronous motor is used for driving a 220-volt, 500-cycle Westinghouse alternator at the Fort Myer (Va.) wireless telegraph station. Although the former is a Westinghouse machine, as stated, the latter is of General Electric manufacture.

* * *

SUGGESTED TRANSPORTATION OF SOFT COAL THROUGH PIPES.—It has been proposed to pump a mixture of bituminous coal and water through pipes from the Illinois coal fields to Chicago to effect an economy over railroad carriage. Engineers have reported that such a plan might be feasible, but whether it would be practicable financially and industrially is another question. The project does not appear to have advanced beyond the stage of discussion.

* * *

PROPOSED MERGER OF MUNICIPAL CORPORATIONS HELD TO BE UNCONSTITUTIONAL.—In response to a resolution introduced into the City Council of Chicago proposing the merger of the city of Chicago and the Sanitary District of Chicago, the corporation counsel of the city has prepared an opinion in which he holds that such a merger of two municipal corporations would be unconstitutional, as in effect granting to the city of Chicago special privileges not enjoyed by other cities in the State. The Sanitary District operates the Chicago Drainage Canal, including a 28,000-kw hydroelectric development.

* * *

ELECTRIC LOCOMOTIVE HEADLAMPS.—Electric headlamps may be required on the locomotives of all railroads in the State of Illinois, as it is reported that a bill to this effect may be introduced at the present session of the Legislature. There is no law in Illinois covering locomotive headlamps. Several of the states, however, have statutory provisions on this subject, and in Indiana, it is said, electric headlamps are required. In Wisconsin the headlamp must be sufficiently powerful to enable the engineer to see an object 800 ft. away. The Railroad Commission of Wisconsin has conducted exhaustive tests on different types of headlamps designed to comply with this requirement.

* * *

PROPOSED PUBLIC-SERVICE COMMISSIONS FOR ILLINOIS.—No doubt several bills will be introduced in the present session of the Illinois Legislature looking toward the formation of public-service commissions in that State. Probably the most important utterance on the subject will be that of the joint committee which has been conducting an investigation under the leadership of Senator John Dailey, of Peoria. In addition, the lawmakers will have before them bills introduced by other members. One of the first of these was that fathered by Senator Samuel A. Ettelson, of Chicago, which provides for two public-service commissions, one having jurisdiction over Chicago and the other over the remainder of the State. By the terms of this bill the Railroad and Warehouse Commission would be abolished, and steam railroads, as well as street railways, gas, electric-service, telegraph and telephone companies, would come under the authority of the two new commissions.

* * *

SOCIETY MEETINGS

MEETING OF MAINE ELECTRIC ASSOCIATION.—There will be a meeting of the Maine Electric Association at Riverton Park, Portland, Maine, on Feb. 24. The secretary-treasurer is Mr. W. S. Wyman, Augusta, Maine.

* * *

ANNUAL MEETING OF THE CONTRACTORS' ASSOCIATION.—The next annual meeting of the National Electrical Contractors' Association will be held at Chattanooga, Tenn., from July 16 to 19. The secretary of the association is Mr. W. H. Morton, 41 Martin Building, Utica, N. Y.

* * *

GEORGIA SECTION, N. E. L. A., TO CONVENE AT MACON.—Macon will be the next meeting place of the Georgia Section of the National Electric Light Association, which holds its annual convention on Aug. 14, 15 and 16. The New Dempsey Hotel will be headquarters for the gathering.

* * *

ARKANSAS UTILITY OPERATORS TO MEET IN LITTLE ROCK.—At a meeting of the executive committee of the Arkansas Association of Public Utility Operators at Little Rock, Ark., on Feb. 3, it was decided to hold the annual convention of the association at Hotel Marion, Little Rock, Ark., on May 13, 14 and 15.

* * *

MEETING OF NEW YORK COMPANIES' SECTION, N. E. L. A.—At the regular monthly meeting of the New York Companies' Section of the N. E. L. A., to be held Feb. 17, Mr. J. W. Lieb, Jr., third vice-president and associate general manager of the New York Edison Company, will speak on rates, and Dr. W. H. Tolman, director of the American Museum of Safety, is scheduled to tell how to prevent 50 per cent of industrial accidents.

* * *

INTERIOR ILLUMINATION.—At a meeting of the Philadelphia Section of the Illuminating Engineering Society to be held on Feb. 21 at the Engineers' Club, 1317 Spruce Street, Mr. Preston S. Millar, president of the society, will present a paper on "The Illumination of Interiors." This paper will be fully illustrated with models, showing rooms with various types of lighting units. Preceding the meeting a dinner will be served at the Engineers' Club at 6 o'clock p.m.

* * *

I. E. S. AND A. I. E. E. BOSTON MEETING.—Feb. 17 in the Edison Auditorium, 39 Boylston Street, Boston, a joint meeting will be held of the New England Section of the Illuminating Engineering Society and the Boston Section of the American Institute of Electrical Engineers. Papers relating to arc lamps will be presented as follows: "The Mercury Arc Lamp," by Mr. Percy H. Thomas, New York; "Ornamental Magnetite Lamps," by Mr. C. A. B. Halvorson, Lynn; "The Inclosed Flame-Arc Lamp," by Mr. W. H. Darrac, Pittsburgh.

* * *

JOINT MEETING IN MILWAUKEE.—The Chicago Section of the Illuminating Engineering Society will hold an all-day meeting in Milwaukee on Feb. 22. It is probable that

the meeting will be begun about 10 a. m. and held in the Milwaukee Auditorium. Papers will be read by Mr. M. Luckiesh, of Cleveland, on "Color of Useful Light," and Mr. F. A. Vaughn and Dr. Nelson M. Black, of Milwaukee, on "Conservation of Eyesight." The Milwaukee Section of the A. I. E. E., the Milwaukee Section of the N. E. L. A., the Milwaukee Electrical League and other societies will participate in the meeting.

* * *

Annual Banquet of Pittsburgh Section, A. I. E. E.—The seventh annual banquet of the Pittsburgh Section of the American Institute of Electrical Engineers was held at the Hotel Schenley, Pittsburgh, Pa., Feb. 8. About 400 attended and addresses were made by Mr. W. S. Murray, representing Mr. R. D. Mershon, president of the Institute, who is absent on the Pacific Coast; Mr. S. B. McCormick, who spoke on "The First Arc Light"; Mr. M. Knowles, whose topic was "Conservation and Its Relation to Hydro-electric Development," and Dr. W. Riddle, who gave a humorous talk on "Entropy and Its Relation to the Ultimate Disappearance of Energy."

* * *

A. I. E. E. Reception.—The closing feature of the mid-winter convention of the American Institute of Electrical Engineers will be a reception and dance at the Hotel Astor at 9 p. m. Feb. 28. As this function takes the place of the annual banquet usually held in February, it will be the social event of the season for the Institute membership, giving excellent opportunity for the greeting of old friends and the making of new acquaintances. Tickets to the reception, at $2.50 each, may be obtained from Honorary Secretary Ralph W. Pope or at the information bureau of the convention at the Engineering Societies Building, 33 West Thirty-ninth Street, New York.

* * *

New York Electrical Society Meeting.—At a meeting of the New York Electrical Society to be held in the Engineering Societies Building, New York, on Feb. 17, Mr. William J. Hammer will describe his collection of electric lamps which was recently presented by the General Electric Company to the Association of Edison Illuminating Companies and is installed in the headquarters of the American Institute of Electrical Engineers. This address will be followed by an informal talk by Mr. Antoine Pollak on the Pollak-Virig rapid telegraph system, which will be shown in operation. A smoker and a reception to President Henry L. Doherty will be held in the rooms of the A. I. E. E. at the conclusion of the demonstration by Mr. Pollak.

* * *

Symposium on Electrical Inspection Methods.—At a meeting of the Kilowatt Club of Brooklyn on Jan. 27 the three men who control the electrical inspection activities of the metropolitan district of the city of New York were present. Mr. H. S. Wynkoop, electrical engineer of the city, spoke on the matter of inspection from the standpoint of the municipality, and Messrs. J. C. Forsyth, chief inspector of the New York Board of Fire Underwriters, and G. E. Bruen, chief inspector of the Suburban Fire Insurance Exchange, treated the subject of inspection historically, practically and with consideration for future requirements. Mr. W. F. Wells, general manager of the Edison Electric Illuminating Company of Brooklyn, was also present and voiced the spirit of co-operation between contractor and central station which is now a prominent characteristic of "electrical Brooklyn."

* * *

Institute of Radio Engineers.—At the annual meeting of the Institute of Radio Engineers the following officers were elected to serve for the year 1913: President, Mr. G. W. Pickard, Amesbury, Mass; vice-president, Mr. R. H. Marriott, New York, N. Y.; secretary, Mr. E. Simon, New York, N. Y.; treasurer, Mr. J. H. Hammond, Jr., Gloucester, Mass.; managers, Mr. J. L. Hogan, Jr., New York, N. Y.; Dr. J. S. Stone, Boston, Mass.; Mr. R. A. Weagant, Aldene, N. J., and Mr. L. Espenschied, New York, N. Y. At a meeting of the board of managers shortly afterward Dr. A. N. Goldsmith, of the College of the City of New York, was appointed editor of publications. At the February meeting of the Institute, held at Columbia University, Mr. Frederick A. Kolster, of the Radio Service, United States Department of Commerce and Labor, presented an interesting paper on the effect of distributed capacity in inductance coils for radio signaling. Copies of the first number of the *Proceedings* published by the Institute have been distributed. The standardization committee anticipates publication within a short time of a list of symbols and definitions agreed upon. The next meeting will be held as usual on the first Wednesday of the month.

* * *

Society for Electrical Development, Inc.—Announcement has been made heretofore in these columns of the conference which the Society for Electrical Development, Inc., is to hold at the Engineering Societies Building, New York, on March 4 and 5, to which the entire electrical industry is invited. The invitation is also extended to advertising agencies and magazine publishers. The object of the meeting is to obtain as full a discussion as possible from the various branches of the electrical industry on the plans that will be proposed for carrying on the work of the society. Among the plans that will be suggested will be one for a broad educational publicity campaign to be carried on through such mediums as home and trade journals of every kind. Another plan which will be discussed is one for the establishment of a press bureau for the dissemination of reading matter relating to electrical subjects. The creation of a traveling, or field, department for the purpose of conducting general educational work pertaining to the electrical industry among architects, builders and manufacturers is also under consideration. The list of those from whom papers and suggestions have been invited includes Messrs. H. L. Doherty, T. C. Martin, F. H. Gale, R. P. Bolton, George Harvey, William D. McJunkin, J. M. Wakeman, Hugh Chalmers, W. E. Robertson, A. W. Burchard, L. A. Osborne and J. C. McQuiston and many others.

* * *

Brooklyn Company Section, N. E. L. A.—One of the largest meetings in its history was held by the Brooklyn Company Section, N. E. L. A., on the evening of Feb. 10. The presence of the feminine employees of the company at a section meeting for the first time contributed in a large measure to the enjoyment of the evening. The pleasure that attended the excellent program was tempered noticeably, however, by the fact that the occasion was somewhat in the nature of a farewell to Mr. W. W. Freeman, who retired on Dec. 31, 1912, as vice-president and general manager of the company to become identified in a similar capacity with the Alabama Interstate Power Company. Following the reading and discussion of a paper on the production of copper by Mr. William H. Grove, of the company's engineering department, a handsome silver service was presented to Mr. Freeman by the employees of the company. In accepting the gift, Mr. Freeman spoke feelingly of his long association with the company and of the warm greetings and tokens of regard he had received from the employees at all times, and especially on this occasion. He expressed the hope that his affairs will permit him to visit the section meetings of the Edison Electric Illuminating Company of Brooklyn at frequent intervals. After Mr. Freeman's talk the audience was favored by Mr. William J. Burns, the well-known detective, with reminiscences of his stirring career. Music, vaudeville and refreshments concluded the program.

Isolated Plant of Gasoline Engine Factory

Features of electrical and steam-heating station of Continental Motor Manufacturing Company, Detroit, Mich. By Harry C. Spillman

THE necessity for sufficient and reliable power in industrial establishments possessing isolated plants has brought with it the realization that whereas a small engine and boiler tucked away in some obscure corner were equal to power requirements a few years ago, these must now give place to better and more modern equipment, and the isolated plant itself must follow the design of modern central stations in many features.

The Continental Motor Manufacturing Company's Detroit factory is modern in every detail and its power plant has many features seldom found in an industrial generating station. This company manufactures gasoline engines for automobiles, and as it operates an extensive machine shop its power requirements are very important. The factory contains nearly 300,000 sq. ft. of floor space and every department and building is designed for future extensions.

Station Design

In designing the power plant careful consideration was given to a location which would make possible an independent siding for handling coal and be central in respect to the factory, so that the transmission and piping lines would not be too great in length. The plant also had to be placed out of the way of the future growth of the factory and have ample room for its own expansion. All these conditions were carefully thought out before the actual design of the plant was started.

Special attention was given to the architectural details of the power house, as it is very conspicuous in its location. The building is a structural steel frame with pressed-brick side walls, cement being used for all window sills, wall coping and ornamental work, thus avoiding the use of cut stone and still making possible a very attractive building. The floors are of reinforced concrete having a live load of 400 lb. per square foot and are of sufficient strength to allow small machines to be placed directly on the floor without a foundation. This stable construction also does away with the necessity of placing shores under the floor when moving machinery. By the installation of "Fenestra" steel sash, which can be opened and closed with sash operators, an unusually light and airy building is secured. The roof is made of "Hy-rib" with a cement coating, upon which is laid four-ply tar and gravel roofing. The building is strictly fireproof, not a stick of timber being used. Steel work starts at the floor line of the basement so as to do away with heavy foundations above the basement floor.

A main tunnel, which is 8 ft. high by 9 ft. wide, is constructed from the power house to the factory and extends to all parts of the main building. There are branches from this main tunnel to each of the seven other buildings. The east side of the tunnel is given up entirely to wires and the west side to piping, including low-pressure steam piping, return piping, live steam pipes, air, gas, city-water and hot-water pipes for industrial purposes. This allows easy access to all pipes and wires and at the same time places them out of the way for future extensions of the buildings.

Boiler Room

The boiler room has large windows and is faced in white-sand lime brick, which makes a light, airy room. The present equipment consists of three Wicks vertical water-tube boilers, each having 2500 sq. ft. of water heating surface and being rated at 250 hp. The boilers are arranged in a

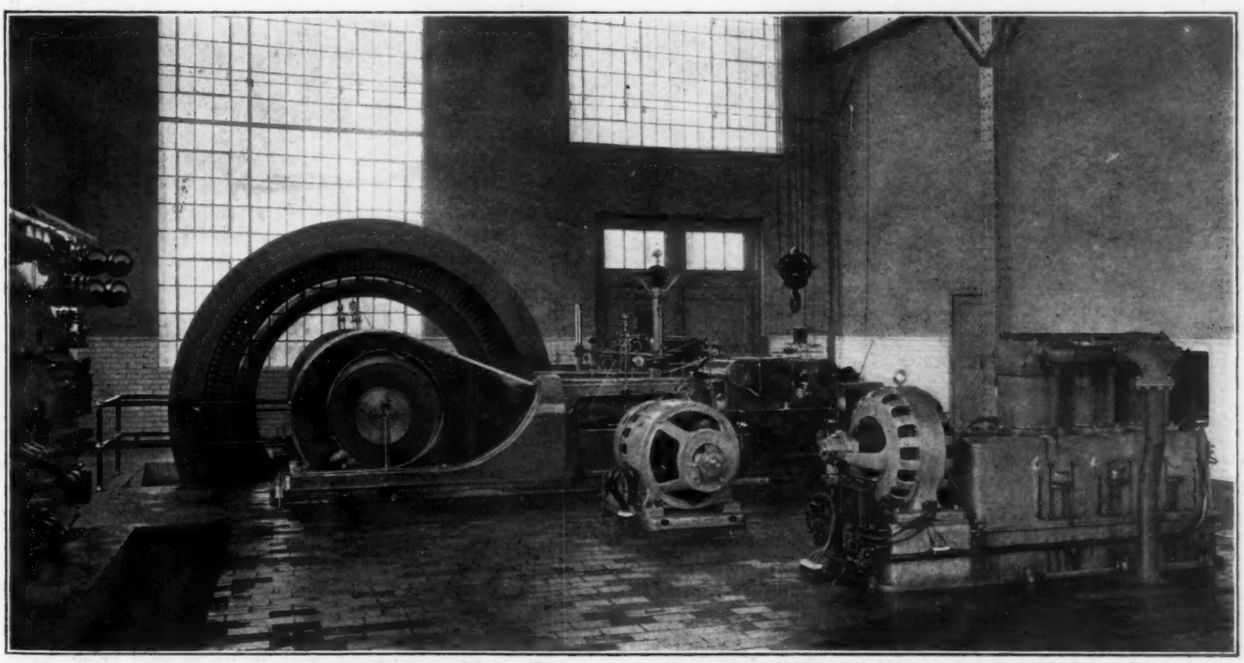


FIG. 1—GENERATING EQUIPMENT OF CONTINENTAL MOTOR MANUFACTURING COMPANY

single row and are designed for 150-lb. steam pressure. The latest improved, heavy-duty type of Murphy stokers are used and are operated by a small inclosed engine. This equipment is guaranteed to evaporate 10 lb. of water from and at 212 deg. Fahr. per pound of dry coal containing not less than 13,500 heat units by calorimeter test. The boilers are fed by two 10-in. and 6-in. by 12-in. outside, center-

FIG. 2—EXTERIOR OF STATION AND WATER TOWER

packed, duplex plunger pumps made by the Deane Steam Pump Company. A steel breeching connects the boilers to a stack which is 8.5 ft. inside diameter at top and 150 ft. high. This stack was erected by the Weidherholt Construction Company and consists of tile facing, both interior and exterior, with a reinforced-concrete core. This gives the chimney all the advantages of a reinforced-concrete stack with a good firebrick lining and also imparts to it an attractive appearance not possible to be obtained with concrete. The name "Continental" is laid in white enamel brick and the letters project 1 in. beyond the face of the stack, so that the rain washes off the dust from the letters and keeps them clean.

Coal Conveyor

A monorail coal conveyor system is installed which runs over the boilers and extends out in the yard, supported on a steel trestle. This trestle is built directly over the railroad siding, and part of the trestlework is inclosed so as to form a storage bin which allows coal to be unloaded directly from the car and either stored in this bin or placed in the metal bins directly over the boilers. The operator rides in the cab and has full control over the conveyor. Large pits are built in front of each boiler so that the fireman can pull the ashes into these pits, and by means of a switch on the monorail the same conveyor can be used to dispose of the ashes. This conveyor is operated on direct current at 110 volts and was designed and erected by the Shaw Crane Company. With the above-mentioned conveyor was furnished a Brown hoist single-rope grab bucket having a capacity of 24 cu. ft. This system is capable of unloading a car of coal and placing it in the bin in two hours. The conveyor will fill the boiler-room bins in about the same length of time with sufficient coal for a twenty-four hour run. This makes a very inexpensive arrangement for a small plant and saves the labor of two men.

Piping Systems

All the condensation, drips, etc., are returned to a Cochrane open feed-water heater rated at 1500 hp. This feed-water heater is located in the boiler room near the pump so that when the power house has increased to double its present size it will be near the center of the room. The blow-off piping is located in the basement, and extension stems are provided on the valves so that they can be operated from the boiler room. This piping is connected to a cylindrical blow-off tank which has a 5-in. vent.

The steam header, which is supported on I-beams near the fire wall directly back of the boilers, extends into the basement, where the ends are connected together, making a complete loop. Valves are placed in the header at intervals so that any section of the header may be closed off for repairs and the steam can be fed around the opposite way to supply the engines and factory. This is a very flexible arrangement, and when the plant is extended another loop can be installed and tied in with the present one.

Iron ladders and grating are placed around the water gages and along the steam header so that the valves are accessible. All the other valves are near the floor within easy reach of the firemen. Every pipe line has the necessary outlets for future extensions, so that an addition can be made without destroying any of the present installation.

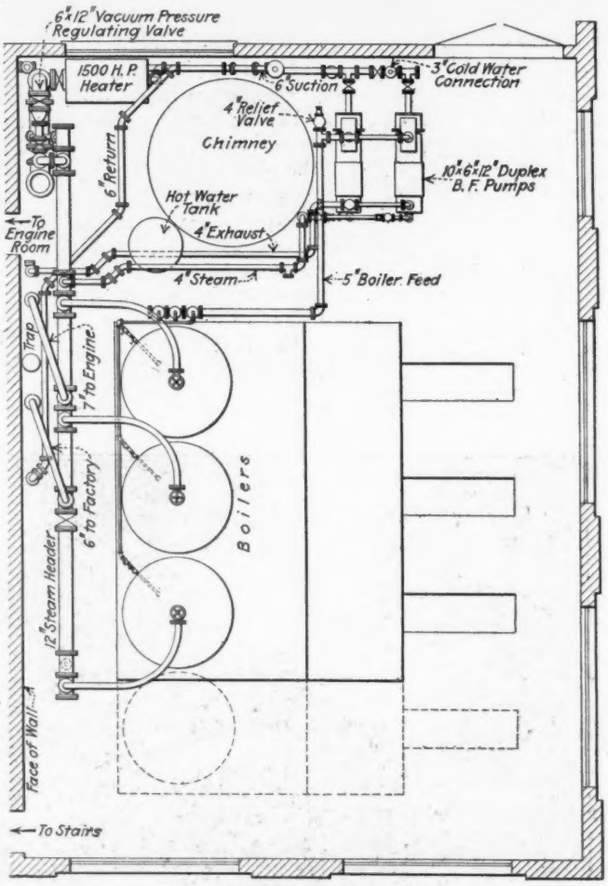


FIG. 3—DETAILS OF BOILER ROOM PIPING

Engine Room

Special attention was given to the engine room, so that there is ample room around each unit and all pipes and valves are placed in the basement where they are very accessible. Attractiveness was not lost sight of, as the side walls are wainscoted with white enamel brick, having yellow pressed brick above, and the entire floor is cov-

ered with 6-in. by 9-in. red tile laid in white mortar. To add still further to the attractiveness of the room the engine pit is lined with white enamel and the railing is made of tubing, which is painted black and has polished brass fittings. The machinery is painted a silver gray, which gives a harmonious blend of color pleasing to the eye.

From the above it may be realized that the engine room is made very attractive and at the same time this is done without a great outlay of money. The engine, which was designed for 23-lb. back pressure so that the exhaust steam can be used for heating during the winter months, is a heavy-duty Corliss cross-compound unit 20 in. and 30 in. by 36 in., running at 120 r.p.m. and rated at 600 indicated hp. It was furnished by the Hoover-Owens-Rentschler Company and is guaranteed to carry 50 per cent overload. The steam consumption at full load when exhausting against atmospheric pressure is 20 lb. per indicated horsepower. A gravity oiling system, complete with overhead tank and circulating pump and filter in basement, feeds oil to all the bearings.

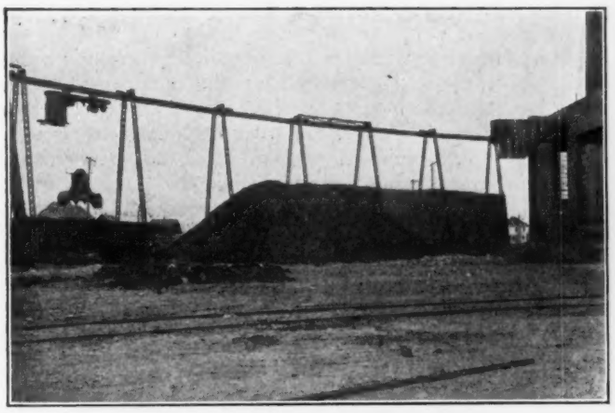


FIG. 4—COAL-HANDLING EQUIPMENT

ELECTRICAL EQUIPMENT

Directly connected to the engine is a three-phase, 60-cycle, 220-volt generator, rated at 500 kva and known as a 35-deg. machine. It was built by the Westinghouse Electric & Manufacturing Company and is guaranteed to carry a 50 per cent continuous overload without undue heating. Energy for excitation is furnished by a small Westinghouse steam turbine directly connected to a 25-kw, 110-volt generator running at 3500 r.p.m. and also by a 40-kw motor-generator set running at 830 r.p.m. The small steam turbine set is also used for supplying energy for the monorail coal conveyor so as not to interfere with the regulation of the main generator. Air is furnished by means of a 300-cu. ft. single-stage air compressor directly connected by means of gear and pinion to a 60-hp Westinghouse motor furnished by the National Brake & Electric Company. This compressor starts and stops automatically at any predetermined range of pressures and also closes the water-circulating valve so that water is not circulating around the cylinders when the compressor is idle.

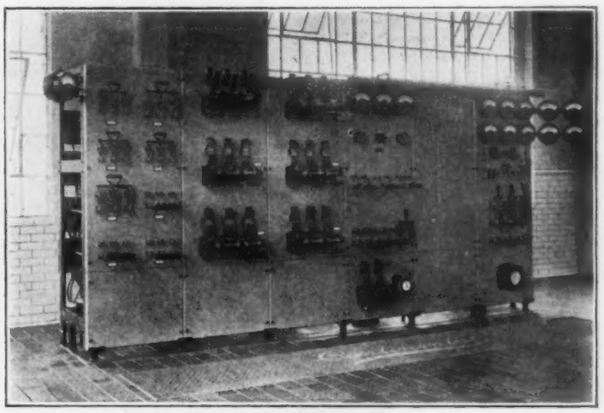


FIG. 6—SWITCHBOARD

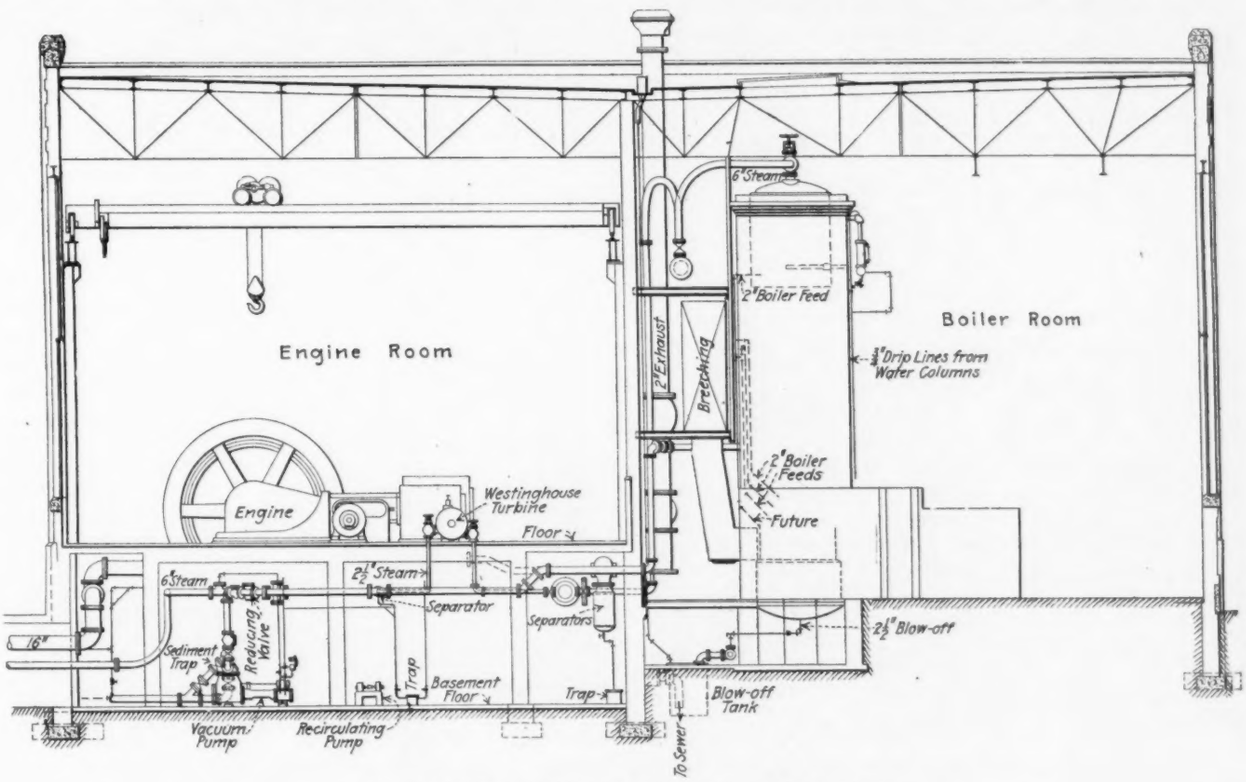


FIG. 5—CROSS-SECTIONAL ELEVATION OF POWER HOUSE

There is ample space in the engine room for another unit, which will be installed in the near future. The entire engine room is covered by a 15-ton Shaw hand-operated crane with two speed hoists and an automatic brake.

The switchboard is made up of six panels of gray Tennessee marble with the grain running diagonally and is made self-supporting by means of a metal framework extending 20 in. back of the board. The front of the board rests on bronze legs finished in black and about 4 in. high. All the trimmings have a black oxidized finish except the switches, which are of polished brass. The swinging bracket contains one frequency meter, a power-factor indicator, and alternating-current and direct-current voltmeters. The generator panels have both alternating-current and direct-current ammeters, voltmeters, an indicating wattmeter, a watt-hour meter, etc.

Each building has its independent circuits for both motor and lamp loads. The motor circuits are controlled by I. T. E. type "LL" circuit-breakers non-closable on overloads, and each circuit has a special switch which connects the indicating wattmeter and power-factor meter in circuit. The average power-factor at the board is 84 per cent, and the lowest on any circuit is 73 per cent. The switchboard is illuminated by means of lin-o-lite lamps, in a manner similar to that used for showcase illumination, in preference to the older bracket lamps.

All the wiring is in conduit and the latter is kept away from the steam pipes so that they do not have to cross each other. The leads from the generator to the switchboard consist of four pieces of ¼-in. by 4-in. copper well taped and suspended on porcelain insulators. All transmission leads are carefully calculated for 3 per cent drop, which gives the same voltage at all points in the factory.

Both the boiler room and the engine room are illuminated by mercury vapor lamps with red reflectors which radiate a white light similar to daylight and make an ideal illumination. Floor receptacles are distributed around the engine room for extension plugs and wall receptacles are used in the boiler room and the basement.

A Venturi water meter is placed in the feed-water line and a CO^2 recorder is to be installed in the breeching and steam meters in the different steam lines. The coal and ashes are carefully weighed each day by means of a scale on the conveyor so that the twenty-four-hour log gives the necessary data for a complete power-house test, and if there are any leaks they are readily discovered.

Almost all manufacturing concerns have a tendency to make their buildings as plain as possible, and this also is a fault of many engineers. As a rule a plain building is unsightly. It required only a few thousand pressed brick for facing the front and side of the power house and a small amount of plaster for the panels to make the station attractive. The entire outlay in excess of what common brick walls without cement trimmings would have cost was less than $500, and the satisfactory appearance more than offsets the small expenditure.

Agricultural College Men May Study Illumination

In the proposed agricultural engineering building at Ohio State University, Columbus, Ohio, it is planned to provide for an "illuminating room." Here electric lighting, ordinary gas lighting, acetylene lighting and other forms of illumination will be demonstrated and tested, with the particular view of their applicability to farm buildings and yards. This is probably an innovation in buildings of this character for agricultural colleges. The new building will be three stories high and cost about $125,000. A novelty, as planned, is a deck roof over a wing of the building whereon windmills may be erected and tested. Prof. H. C. Ramsower is in charge of the agricultural engineering work at the university.

Electric Express Handling at the North Station, Boston

A conspicuous illustration of the flexibility and efficiency of electric trucks of the industrial type in the handling of express matter is furnished by the installation of the American Express Company at the North Station in Boston, Mass., one of the largest and most active steam railroad terminals in America. For the past ten months a considerable part of the work of transferring express shipments between trains and the receiving and dispatching rooms at the terminal has been accomplished by a fleet of Buckwalter electric baggage trucks, and the installation has been so successful that the present equipment of sixteen machines is to be increased to twenty-four of the same make at the earliest possible moment. Four of the trucks are owned by the National Express Company.

All of the trucks are of the so-called drop-frame type, 12 ft. long over the body, 44 in. wide and equipped with two platforms carried respectively 33 in. and 10 in. above the floor. Each truck is provided with two end standards carried to a height of 7 ft. above the floor and has a load rating of 4000 lb. on a maximum grade of about 12 per cent. The width over wheel hubs is only 45.5 in., and each truck weighs unloaded, with battery, about 3000 lb. A single motor of the series-wound type drives the truck by double-reduction gearing, the motor being located beneath the upper platform at one end and the battery at the other.

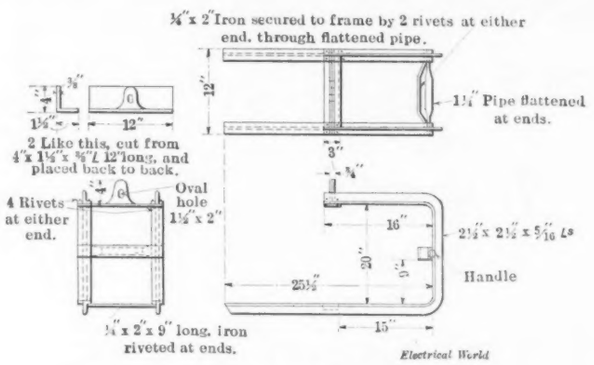

¼" x 2" Iron secured to frame by 2 rivets at either end, through flattened pipe.
1¼" Pipe flattened at ends.
12"
2 Like this, cut from 4" x 1¼" x 5/16" L 12" long, and placed back to back.
Oval hole 1½" x 2"
4 Rivets at either end.
16"
2½" x 2½" x 5/16" L's
Handle
25½"
¼" x 2" x 9" long, iron riveted at ends.
15"
Electrical World

FIG. I—DETAILS OF BATTERY CRADLE

The battery equipment consists of twelve cells of the United States Light & Heating Company's "WB-15" type and weighs about 850 lb. The speed varies from 4 miles per hour loaded to 6 miles per hour empty, and double-end control is provided.

Each truck is equipped with four wheels having 27.5-in. by 3.5-in. Goodyear tires, and the wheels are connected with the steering lever at each end in such a manner that all are simultaneously moved by a single turn of the handle by the operator. This arrangement facilitates handling the truck in an extremely limited space. The double-end control permits operation on narrow platforms and runways without turning the truck around, thus relieving congestion and minimizing the possibility of accidents. In operation the attendant simply inserts the steering and controller handles in their respective sockets on the end of the truck which happens to be pointed toward the destination. The operator stands on a hinged platform at either end, the platform being so sectionalized that unless the man in charge of the truck stands squarely on each section the machine cannot be started. The removal of the operator's right foot from one of the platform sections immediately applies the brake, assuming that the man is facing forward. Three forward and reverse speeds are provided, with rheostatic control governed by switch handles which are inserted in sockets at either end.

The brake is the double-expanding internal type, and the truck can be stopped when operating at full speed loaded in

about 8 in. The trucks were manufactured by the Elwell-Parker Electric Company, of Cleveland, Ohio.

The charging of the truck batteries, inspection and maintenance of the equipment are handled in a corner of the American Express Company's sorting room at the North Station, fronting on the Nashua Street side of the terminal. Electric trucks and teams in the company's street service

FIG. 2—ELECTRIC EXPRESS TRUCK

receive and deliver merchandise at this point, making in many cases a complete electric transfer of shipments from express car to consignee, or vice versa. As the industrial trucks are in service day and night, twelve extra batteries were purchased when the installation was made last spring, and the facilities for rapid transfer of batteries to and from trucks are noteworthy. Batteries not mounted in trucks are parked on 8-in. by 12-in. wooden blocks at one side of the room close to the wall, and twelve charging circuits are brought to these stands from a switchboard mounted in the office of the superintendent of truck service, Mr. G. B. Lipphardt.

The battery stands are treated with asphaltum, and a 6-in. by 6-in. wooden bumping block 30 ft. long is installed on the floor outside the row of batteries to protect the latter against blows from passing vehicles or merchandise. The blocks are spaced 22 in. apart on centers and are about 3 ft. long. Batteries are transferred to and from the stands by a 1-ton hand-operated chain hoist traveling in a 6-in. I-beam overhead runway attached to the ceiling and about 50 ft.

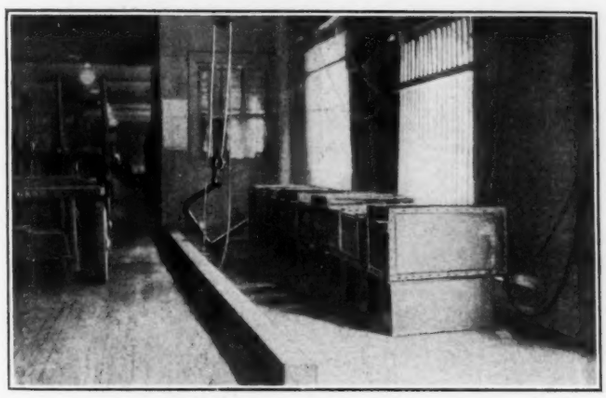


FIG. 3—PARKING BATTERIES

long, including a right-angled turn into the center of the room which facilitates rapid handling through the elimination of extra movements of the trucks. Fourteen batteries can be parked in the charging division at one time. A 31-in. by 90-in. pit 6 ft. deep with removable cover is located in the floor to enable the under side of the trucks to be inspected, and eye-bolts in the ceiling above the pit are shortly to be equipped with chain hoists by which a complete truck can be raised well above the floor level, to enable examination and light repairs to be made quickly. Three trucks can be lined up at once for inspection or removal of batteries, despite the limited area of the garaging space. A battery can be disconnected, removed from a truck and another put in its place inside of three minutes, and a battery can be lifted from the floor and set in position on the

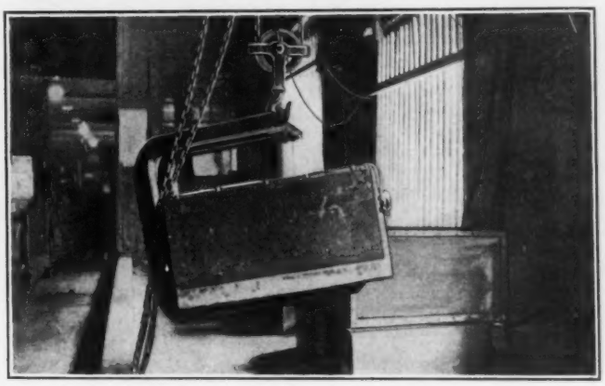


FIG. 4—HANDLING BATTERY BY HOIST

truck frame in about thirty seconds. Wooden battery boxes with reinforced steel corners have been found preferable to those of steel construction, as the former are more easily ventilated and kept clean.

A special feature of the battery-handling equipment is an angle-iron cradle illustrated in the accompanying drawing which is used in transferring the cells from the trucks to the stands and vice versa. The cradle consists of two U-shaped 2.5-in. by 2.5-in. by 5/16-in. angles, the upper portions being 16 in. in length and the lower 25.5 in. long, spaced 12 in. apart horizontally, with a clearance of 20 in. between each prong. At the front ends of the upper prongs a 3-in. by ⅜-in. cross-bar is riveted, the latter consisting of two back-to-back angle irons with the stock cut away from the center, leaving a lug in which a 1.5-in. by 2-in. oval hole is drilled for the reception of the hook of the hoist. The lower prongs are cross-braced by a ¼-in. by 2-in. strap, 9 in. long, riveted to the prongs at a point 15 in. from the bend, and a 1¼-in. iron pipe with flattened ends is carried across the back of the cradle from side to side, serving as

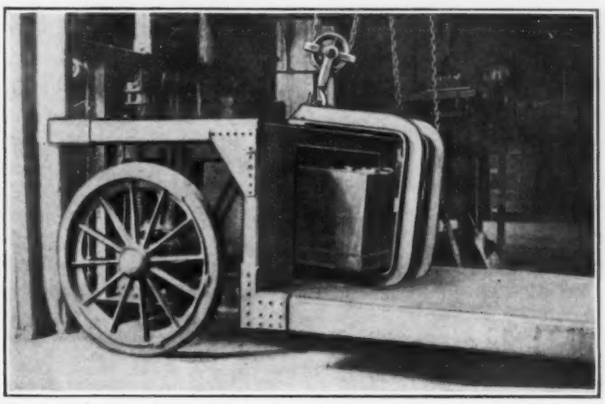


FIG. 5—REMOVING BATTERY FROM TRUCK

a handle and protected from the battery box by a ¼-in. by 2-in. offset strap on the inside.

Energy for charging the batteries is taken from the local power plant of the terminal at 115 volts. The switchboard consists of three panels 7 ft. long by 5 ft. high over all, containing an installation of Cutler-Hammer controlling apparatus; central-zero ammeter, voltmeter, circuit-breakers and fuses. All cables running to charging points are num-

bered with brass disks, and each circuit is equipped with a pilot lamp showing its operative condition. Plug switches are provided to throw the ammeter and voltmeter into any circuit as desired. The rheostats are mounted on an iron frame at the rear of the board. A maximum-demand meter is placed behind the switchboard as energy is purchased from the terminal plant, and a recording wattmeter is also

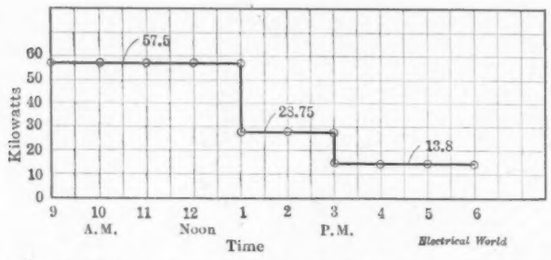


FIG. 6—TYPICAL LOAD CURVE CHARGING TEN TRUCK BATTERIES

in service. Three batteries are usually charged in series. The batteries are never allowed to run below 26 volts and 50 amp each on charge. In a typical charge the battery is supplied with energy at the 50-amp rate for four hours, at 25 amp for two hours and at 12 amp for three hours, the length of time at each rate depending upon the response of the battery. Two men are assigned to the work of charging and battery inspection, and ordinarily charging is carried on the plant as a day load. All batteries are fully charged before being placed in service. In general, one truck is kept in the garage at a time for overhauling, a bench being provided for this purpose in the switchboard room. Thus far the cost of repairs has not exceeded $1 per truck per month, and the cost of energy per truck per month has averaged about $2. A truck averages from 20 to 25 miles on one charge of a battery, and each battery, having a capacity of 196 amp-hr., operates as a rule two days per charge. The average monthly truck mileage is 7200 and the corresponding energy consumption 2800 kw-hr.

The conditions at this station are among the most severe in the country, there being 738 inward and outward trains every twenty-four hours. The station contains twenty-three parallel train tracks under a single roof, with intermediate and side platforms varying from 7 ft. to 16 ft. in width, the usual width being 7.5 ft., allowing for center columns. At one end of the station the trucks are obliged to surmount a 12 per cent grade 60 ft. long, including a 90-deg. turn near the top. Express rooms are located at each end, and the outer platforms leading to the trains are level with the floors of the cars, but as only a small percentage of the total tonnage is loaded into the cars on this level, the freight trucked to and from the trains has to be transported up or down the incline above mentioned or over a less steep grade at the opposite end of the building.

At the foot of the 12 per cent incline is a gate where passengers are constantly crossing the path of the trucks, and the safety features of the latter are important at this point. When coming down the incline the operator can jump off the truck and stop it within 2 ft., even though the truck is operating at full speed and under full load, through the automatic application of brakes which results from the operator's leaving the platform. Not a single accident has yet occurred in the use of the trucks in this station, despite the fact that their route traverses at right angles the entrance to and the exit from every train track in the station. This is an important source of economy in operation, as it is not an uncommon occurrence for a passenger to be injured by the ordinary hand-operated trucks, and such an accident usually requires a settlement by the claim department. Only one man per truck is necessary even on the 12 per cent incline, whereas with the old hand trucks it was necessary to use two men per truck, with additional helpers when on the 12 per cent grade. The labor question was formerly a serious one at this point, as the work was so heavy that the men were continually quitting, making it necessary to employ green attendants and thereby handicapping the service. A great saving has also been shown in decreased damages. Packages often dropped off the old hand trucks, but this trouble has been entirely overcome with the electrically driven outfits, as all jolts and shocks are absorbed by the solid rubber tires and the flexible construction of the frames. Faster time can also be made over rough concrete walks and platforms on account of the diminished jarring of the truck, a speed of about 2 miles per hour being the maximum which is safe with hand trucks.

Closer connections can be made with trains on account of the higher schedule speed of the electric truck. Time is also saved in sending men to trains on heavy jobs, and as they return to the transfer room on the truck instead of walking, as in the old days, the tendency is for a much larger output to be produced and with less effort for the men. Any point in the station can be reached in three minutes, and the trucks discharging and loading at the terminal in the outside street make much shorter stops as a result of the installation of electric service. The electric equipments require less space than the hand-operated trucks and perform about double the work of the latter. In the movement of express matter to and from trains one truck and one man do the work of four men and two hand-drawn trucks, not including loading and unloading. A better class of men apply for work with the electric trucks than formerly operated the hand trucks.

In the operation of the trucks all are carefully examined before being placed in service, and each truck is provided with a number 3 in. high to facilitate reference to it by passengers and employees. Operators do not apply full power in starting, but work the controller on the step-by-step plan common in street-railway work. Operators are not allowed to enter into conversation with anyone while running a truck and are required to watch gateways and passages with great care while on the running board. When operating on the main platform at the bumper ends of the train tracks the trucks take the middle of the course except that in passing others those operating on the main platform are given the right-of-way over those approaching from

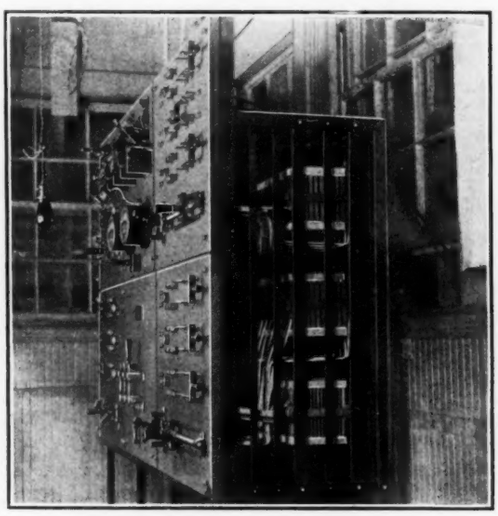


FIG. 7—BATTERY-CHARGING SWITCHBOARD

trains. Running backward in the station proper is also prohibited in the rules given to operators of trucks, and no running of trucks with trailers is permitted. Trucks proceeding in the same direction are required to keep 15 ft. apart, except when otherwise ordered by special authority. The express service of the American company at the North Station is under the supervision of Mr. H. F. French, agent.

The Retail Dealer and Electric Appliance Sales

To collect information useful to the whole industry on the subject of electric-appliance sales and present conditions in the trade, the *Electrical World* recently mailed letters of inquiry to 3200 retail dealers and contractors whose names appear in the McGraw Electrical Directory. The list included cities and towns of various sizes in every state and section of the country, thus insuring not only thoroughly national representation in the opinions expressed but the reflection as well of the views held in both large and small communities.

The questions asked are given in the accompanying table, together with a tabulation of the replies received from the dealers. Frank statements in reply have been encouraged by assurance that the individual sources of the comment and information received would be treated with all confidence.

As set down in the following paragraphs, the replies received from the 424 representative retailers who answered have been carefully classified and analyzed, in the belief that effective light may thus be shed on present conditions in the electrical trade and the readjustment needed to place trade relations on a more stable basis.

In answer to the first question, relating to the device most satisfactory to retail, the replies were, as might be expected, overwhelmingly in favor of the electric iron. Of the total number, 304 gave the iron first place, the next contestant for honors being the electric toaster with 36 votes. Other appliances receiving mention were as follows: Motors, 25; vacuum cleaners, 20; electric fans, 18; lamps, 15; washing machines, 14; electric stoves, 13; percolators, 7; warming pads, 6; radiators, 3; curling irons, 1. Similar estimates of the relative values of other appliances besides irons were afforded by the replies to the fourth question.

The greatest difficulty met by the retailers in building up a profitable flatiron business, according to the results of the canvass, seems to lie in the activity of central stations in selling devices at cost or even below cost in order to further the consumption of electricity. Some of the comment received from dealers on this policy of the central station is particularly bitter and indicates that the ill feeling engendered between local branches of the industry may embarrass other relations essential to the development and prosperity of both parties.

As one correspondent pointedly asserted, the customer quite naturally expects that the central station will prefer to sell him a device that consumes a large amount of electricity and he is not to be blamed if he at once suspects any price cutting which can be attributed to this motive. From the dealer, however, who has no further interest than the sale of appliances and the making of a satisfied customer, the purchaser expects unbiased advice; and later, feeling that he is getting an economical, efficient iron, he will have no fear about making liberal use of it.

In a case cited by the writer already quoted the central station a year ago gave away, absolutely free, 200 irons. When the first month's bills came to these 200 users the increases evident caused much dissatisfaction and criticism of the company's intentions in giving away the irons. Even now the customers who kept the free irons, according to the correspondent, do not use them nearly so much as they might have done had they bought the irons in the first place. "We know," writes one contractor, "that the electrical dealer can sell heating and cooking devices more easily than a central station, and the only reason for this is that the consumer knows (or at least he thinks) that if he purchases from a dealer he is getting a device that will consume the the least amount of energy."

Cheap and consequently poorly constructed irons, such as are sold by the department stores and hardware dealers, are also credited with injuring the legitimate business of electrical supply dealers. The low price at which these goods can be profitably sold embarrasses the dealer with a first-class article, and, later, the poor service given by the cheap iron destroys confidence in electrical devices in general. Several correspondents also cited the central-station rate for electricity as being too high for the economical operation of irons.

The generous guarantees proffered by certain manufacturers seem to be another difficulty in the way of the small dealer, whose margin of profit is already pared to the livable limit by sale conditions. The iron itself may be injury-proof, but such incidents as blown fuses, broken cords, etc., which follow in the wake of its installation sometimes prove expensive to the local dealer, on whom the customer depends to make good the sweeping guarantees of the maker. Blowing of fuses caused by the extra current demand of the irons, breaking of cords, attachment plugs, etc., are all accidents which, although clearly outside the makers' guarantee, cannot be so easily explained away to the customer's satisfaction, nor can he be convinced that he should pay the cost of sending a man to make such repairs. Rather than argue his position as to the extent covered by the guarantee, the dealer sustains the cost of the repairs and thus absorbs his own profit.

TABULATION OF REPLIES RECEIVED FROM DEALERS IN ELECTRICAL DEVICES

1. **What energy-consuming device is the most satisfactory to retail?**

Electric irons, 304; vacuum cleaners, 20; fans, 18; washing machines, 14; stoves, 13; percolators, 7, etc.

2. **What is the greatest difficulty, if any, you are meeting in building up a profitable flatiron business?**

Cutting of prices by central stations to cost and below cost. Competition from poorly constructed and cheap devices. Unlimited guarantees of manufacturers.

3. **What is the greatest assistance you are receiving in building up flatiron business or sales of other devices?**

Assistance of manufacturers, general and local advertising. Dealers' sales effort and advertising. Central-station activity. Window and store exhibits. Also complaints of "no assistance from any source."

4. **What electric heating or cooking devices, besides flatirons, do you find it most profitable to retail?**

Toasters; percolators; electric ranges; luminous radiators; grills; stoves.

5. **Are you actively promoting the sale of any one line, or are you carrying in stock various makes of electrical devices?**

Carrying only single line, 122; various makes, 265.

6. **Do you find that most customers ask merely for "electric irons," or is there a demand for some one make? If there is a decided preference for a particular make, to what do you attribute this demand?**

Ask for merely "electric irons," 277. Demand special make, owing to popular advertising, 71; owing to previous experience, quality, etc., 35.

While a number of dealers flatly insist that they have received "no assistance of any kind" in furthering their iron and apparatus sales, the majority stand ready to admit that the advertising done by the manufacturers has awakened the public's interest in the use of electric devices. The answers received to the sixth query, however, show that, in an overwhelming proportion of cases—277, in fact—the customer enters the store and asks simply for "an electric iron," leaving the selection to the dealers' judgment and experience. Only seventy-one dealers reported that their customers demanded a special make of iron as the result of national and local popular advertising. Thirty-five others traced the demand for a particular brand to the customer's previous experience with the same make or the advice of a friend. In at least six places from which responses were received local pride in a nearby electrical factory controlled the choice of purchase. Many of the dealers reported that their own advertising in local papers was especially effective, although they profited also from the campaigns conducted by the central station. Others in-

sisted that for their greatest assistance in making sales they depended upon the efforts of their own salesmen and their display windows. Satisfied customers and free trials of the apparatus were also cited as useful factors. In the language of the dealers themselves, "customers rarely ask for a particular make and can be easily influenced from one to another by the salesmen." "The choice of the iron purchased is usually left to the dealer's judgment." "Most customers want the iron the dealer recommends." "Few laymen know that there is any difference in electrical devices."

Local Absorption in Radiotelegraphy

By A. H. Taylor

The general absorption of electromagnetic waves by the medium traversed has been studied for the conditions prevailing in practical radiotelegraphy at sea by Austin.[1] Unless this absorption over land areas is much greater than over water, it is not of serious importance to the amateur operating over distances not exceeding 50 miles and with wave-lengths not less than 300 m (985 ft.). By local absorption certain phenomena caused by purely local conditions at sending or receiving stations are referred to.

H. True[2] has studied that form of local absorption due to earth currents and shown that it may be partially avoided by the use of a false ground. There are other local effects, however, which are of more immediate importance to the amateur, who must often take conditions in a given building or neighborhood as they are and make the best of them. Among these effects are those caused by the proximity of energy-transmission, lighting and telephone circuits and of grounded conductors such as gas, steam and water pipes.

Absorption Due to Resonance Effects

Some field tests in connection with the departmental radiotelegraphic apparatus at the University of North Dakota necessitated the use of a rather short wave-length, namely, 245 m. This length was obtained by allowing the aerial to discharge directly through the spark-gap to earth, as in the original Marconi experiments. The spark-gap was about 3 cm long and the primary of the induction coil absorbed 300 watts. The ammeter in the aerial circuit indicated somewhat less than 1 amp. The aerial at that time consisted of four wires, spaced 2 ft. apart, run up from the second floor of Science Hall to a pole on the roof, with a total height of 30 m. The aerial was slightly bent, but at no point except at the base did it approach the building nearer than 10 ft. The alternating-current circuits used with the induction coil had no connection with the lighting system of the building, which is operated on 220 volts direct-current energy. Nevertheless, this particular wave-length set up current surges in the lighting circuits of the building, which resulted in the blowing of several fuses, the starting of two motors and the burning out of several tungsten lamps. Altering the wave-length eliminated these undesirable effects, but it is quite evident that a very considerable amount of the radiant energy of the aerial could have been absorbed without causing a catastrophe of such a nature as to call attention to the presence of these surges in neighboring circuits. The trouble was also avoided without changing the wave-length of the aerial by altering the free oscillations in the lighting circuit considered as a Lecher system. This was accomplished by putting two condensers of 1 mf. capacity each across the line at two experimentally determined points. It is quite likely that similar effects occur in the neighborhood of aerials used for receiving only, resulting in the elimination of large areas of energy from the wave front.

[1] *Bulletin* of the Bureau of Standards, Vol. 7, No. 3.
[2] Dissertation for doctor's degree, University of Göttingen, 1910.

Absorption by Insulated Conductors

Since the above-mentioned experiments were performed, a new serial with a free wave-length of 450 m has been erected. This is operated by a loose Tesla coupling, the energy being furnished by a self-controlling transformer which is used in connection with a rheostat. Two alarm clocks operate switches controlling an automatic sending device which repeats a sample message of a few words, containing all the letters of the alphabet. This makes possible the study of receiving conditions at distant stations; for instance, at the author's home in the city of Grand Forks, 3 miles from the university, using small sending power and a very short single-wire receiving aerial. At first the receiving apparatus was installed in a tool-house well removed from all overhead conductors, and a receiving aerial 10 ft. high was found necessary in order to read clearly signals sent from the university with 50 watts indicated power on the primary of the transformer. The wave-length was about 460 m. Later the apparatus was moved into the house, which is connected with the city alternating-current lighting system. The same signals were then received at the same intensity with a 3-ft. aerial, as indicated by shunting the telephone. The intensity of these signals, however, was greatly increased when this aerial was brought near an electric lamp. Evidently, the lighting system acted favorably as a collector and reacted on the aerial by induction. This point was tested by disconnecting the lighting system, and in consequence the signals were greatly reduced in intensity. It is evident that any speculation as to the radiant efficiency of the sending station based on indoor observations would have been far astray.

Grounded Conductors

It was suspected that the proximity of grounded conductors would have an unfavorable effect. Such was found to be the case, for with the apparatus installed in two different houses having gas illumination, no audible signals were received until the aerial was raised to a height of 15 ft., that is to say, several feet above the second-floor level, even though 150 watts was applied to the sending transformer. When the apparatus was moved to the second floor, the height of the receiving aerial above the ground remaining the same, the signals were very loud. The ground connection in this instance was on a second-floor radiator. The indications were that the portion of the aerial between floors was inactive in the first experiment; indeed, it was detrimental, because its lateral capacity effect to surrounding grounded objects acted as a shunting capacity around the detector circuit. The detector used in these experiments was a carborundum crystal of unusual constancy and fair sensitiveness. The coupling was a loose auto-transformer device, adjusted for maximum strength of signal.

The inferences to be drawn from these three cases are as follows First, conductors in the immediate vicinity of radio-electric stations should be examined for resonant surges which may be followed by dangerous arcing and which, in any event, absorb a considerable portion of energy. If the wave-length radiated is not changed, these surges may be prevented by capacity loads[3] placed at suitable points on the circuits. The condensers should be fused to prevent short-circuit in case of a puncture being formed. Second, the presence of insulated overhead circuits may be favorable for the reception of signals with short aerials when these aerials are close to such circuits. In general, however, these circuits would absorb considerable energy which would not be re-radiated to an aerial. Third, in a building containing grounded circuits it is best to locate the receiver as high as possible. Some experiments made with 150 watts sending power with a receiving station 35 miles distant seem to confirm this point.

[3] It is best to put two capacity units in series and ground the middle point.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods, and Current Practice Among Successful Utilities

Electric Ice Making in Minnesota

Among recent contracts closed by the Minneapolis General Electric Company is one for a ten-year period with the Minneapolis Artificial Ice Company covering 180 hp. The Twin Cities lie in the center of a district containing countless beautiful little lakes of glacial origin, and with the brisk winter weather enjoyed by the North Star State the natural-ice crop is one that "never fails." The superior advantages and economies of electric ice making are such, nevertheless, that the central station can successfully compete, even here, with the free dispensation of old Boreas himself. Several electric ice-making plants are already in operation in Minnesota.

Justifying Distribution-Line Extensions

In a discussion of the problems of justifying and building line extensions for reaching new customers and districts, before the Wisconsin Electrical Association, Jan. 15, Mr. C. R. Phenicie, general superintendent of the Wisconsin Public Service Company, referred to the custom of some companies in running a new line or an extension of an old one if they can see that the initial cost of the line will be covered by two years' gross revenue from it. But whether this criterion will in reality make or lose the company money, said the speaker, must be determined for each individual case. A utility whose percentage of net earnings to gross earnings is 35 or 40 can afford to run farther and do more generally in the way of new lines and the taking on of new business than one whose ratio is 10 or 15 per cent.

In any event, the problem of just how far to run a new line or how much money to spend reaching out for new business of uncertain character is very important. The central station's duty to its public is to reach everyone who desires its commodity, provided that in so doing a heavier burden is not imposed on those already served. The question when to build and when not to build is a vital one.

A careful study should be made of the respective streets to determine those that will build up the most rapidly; which with high-class residences and which with more moderate-priced dwellings. Very often these conditions are more or less established before a line is attempted. Factories, for example, establish themselves in outlying districts and form a nucleus for residences built for their workmen.

Much money has been wasted by mistakes in determining where the demand for electric service is going to grow in any particular district. Many times a trunk line has been built down one street or thoroughfare only to find that this trunk line has to be duplicated by another only one or two blocks away, in order to serve the community properly.

Having determined where the growth is going to be, and having studied the character of the occupants by means of soliciting, investigating their probable early adoption of electric service, the next step is to determine the most direct means of reaching them. Considerations of route include study of streets, alleys, pavements, parkways, trees, and the attitude of the frontage owners and city officials. A great deal of thought should be given this subject, and it should be borne in mind that it is not always the shortest route to a given center of distribution that proves the best.

Flat-Rate Campaign at Fall River, Mass.

A highly successful flat-rate campaign for residence-lighting business has been under way at Fall River, Mass., since last June, the work having been advertised by effective newspaper displays and by a large electric sign illustrated in the accompanying photograph. The sign is located on the roof of a downtown building and is 32 ft. long, 10 ft. deep and stands 6 ft. above the cornice. It contains 614 4-cp metallized-filament lamps, 398 of which are in the letters and 216 in the border.

With the aid of five extra solicitors the company has secured 600 additional customers in the past six months.

CENTRAL-STATION OFFICE AND SIGN, FALL RIVER, MASS.

The newspaper advertisements emphasize the schedule rate of $1 for four 25-watt lamps per month, burning without regard to hours of use, but connected under an excess indicator, which limits the demand at any one time. The wiring is done under the company's supervision at a nominal charge.

Central-Station Oil-Well Pumping in Texas Field

One of the paradoxical conditions of the oil industry is now being witnessed in the pioneer Spindle Top field of Texas, where crude oil is being discarded as fuel for the operation of pumping engines, in favor of pumping the wells by electricity. Naturally it might be expected that oil producers would find their own product cheap and advantageous to use, but since the recent advance in the price of the fuel, it is found much more economical, it is claimed,

to operate the pumps by motors than by burning oil to generate steam.

Recently fourteen electric motors have been installed on Spindle Top, and they are pumping more than twenty-five wells. It is claimed by those who have adopted this power that they are saving from 25 to 75 per cent in operating expenses, as compared with steam power where fuel oil was used. The motors employed are arranged to develop 10 hp when pumping and 30 hp when "pulling" wells. By changing over a switch the motor is transferred from the lower to the higher power, with double speed. Motors are also being used to pump salt water from the wells into reservoirs.

The adoption of electricity for power purposes in the Spindle Top oil field is attracting much attention among the oil men of other producing territory in Texas and nearby states.

"Swarm of Fireflies" at Mobile's Carnival

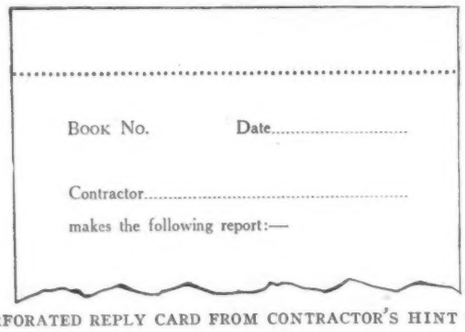
Elaborate electrical decorations made brilliant the streets and public squares of Mobile, Ala., during the city's carnival celebration held the week of Feb. 3. Streamers of colored lamps formed a blazing canopy over Government and Royal Streets.

In Bienville Square the great oaks surrounding the fountain were selected as the background against which, intertwined among the boughs, hundreds of twinkling incandescent lamps "glittered like a swarm of fireflies tangled in a silver braid." A system of flashers controlled the lamps, switching on and off alternate groups so as to simulate the indiscriminate flashing of firefly lanterns amid the foliage of the great trees. To secure the necessary contrast, the white lamps on the decorative posts bordering the plaza were replaced with deep red globes during the "firefly" exhibition.

The fountain in the square was converted into a beautiful electrical display during carnival week by illuminating it with varicolored light thrown by a powerful projector with revolving color screen, mounted directly over the flowing streams of water.

"Brighter Brooklyn" Hint Books for Contractors

Realizing that every electrical contractor in Brooklyn is jointly interested with it in the city's electrical development, and that any plan likely to result in increased efficiency in securing new business or handling customers should therefore be of mutual advantage, the Edison Electric Illuminating Company of Brooklyn is about to send to each electrical contractor in its territory what it calls the



PERFORATED REPLY CARD FROM CONTRACTOR'S HINT BOOK

"Brighter Brooklyn Red Book for Electrical Contractors." This is a pocket-size loose-leaf memorandum book, with a neat cover of red leather. The book contains a number of detachable postal cards addressed to the company, the purpose of these cards being to provide the contractor with a ready means of transmitting to the company any information which he believes might be of mutual value. The foregoing is part of the explanation that is given on the flyleaf. The latter also bears the name and address of the contractor to whom the book is sent, together with the following sentences:

"Carry this book with you, jot down and forward notes, suggestions, 'leads,' complaints. All cards received will be given prompt attention and you will be notified of the results of our investigation, a complete record of which will be kept in our office. By using this book you may accomplish two things: (1) Increase the satisfaction of customers with service conditions; (2) obtain more customers. It is hoped that you will take an interest in this matter and that we may hear from you frequently."

This bears the signature of the general sales agent. On the side intended for remarks the cards are stamped simply with the number of the book, a date line and the words, "Contractor ——— makes the following report." When the contractor runs out of cards more will be sent to him by the company upon his request.

The idea is an outgrowth of a similar notebook that has been in successful use by the Brooklyn company's employees for a number of years. On the first day of each year every employee receives a vest-pocket size notebook with detachable leaves, each of which bears simply the number of the book. A record is kept of the names of the various employees and of the books assigned to them.

Suggestions of any kind for improving the company's service or increasing its business are turned in to the general sales agent on the pages of the book and "lead slips" issued to solicitors when the suggestion contains data referring to prospective customers.

At the end of the year cash prizes are given to the three employees who have turned in the greatest number of leads resulting in the signing of contracts. During 1912 the employees turned in 4643 of these "leads," of which 1833 resulted in original contracts being signed, forty-five in renewal contracts and four in the sale of fans. Three "leads" turned in brought about the sale of as many flatirons.

Electric Rates and Classification of Customers*

When a business is subjected to unlimited competition all its rates automatically seek a level where they give the owner barely a minimum return, for when they rise above this level more competition develops, and when they fall below it competition ceases until they rise again.

In the case of public-service monopolies, however, it is expected that public sentiment, the courts or commissions will regulate the rates to a point at least as low as they would have been in the long run if subject to competition.

The degree of monopoly of public-service corporations is greatly overestimated, since most of their monopoly is in form only. A company may have exclusive rights to supply electricity for lighting, motors, heat, etc., but it has no monopoly in the supply of light, power, or heat as such, for it, respectively, has as active competitors candles, oil and gas; animal power, gas and oil engines and steam engines, and gas, oil, coal and blankets. Thus it finds tremendously active competition in substance—competition which seriously affects its business the moment it raises its prices above a certain point.

Below this the company may have a monopoly, but public sentiment requires that its prices shall, in the long run, be lower than if the competition were unlimited, and this point is where all the prices together produce just a fair return on the investment.

Division of Costs

The question of division of costs among different customers or classes is entirely separate from the question

*Prepared by a member of the rate research committee of the National Electric Light Association.

of total costs or fair return. Having decided what a fair return on the investment is, the question is still open, How shall rates to produce this income be adjusted between different classes of customers?

The first answer (and a theoretically correct one) is that each customer shall be charged at least what it costs to serve him. But this distributes only a small portion of the costs. For example, if a farmer kill a calf and skin it, what is the cost of the veal and what is the cost of the hide? The cost of curing the hide is clearly part of the cost of the hide, and the cost of storing and selling the meat is part of the veal cost, but the original cost of the live calf and of the labor of killing and skinning are joint costs which may belong to either. Again, if a railroad train is going anyway, the extra cost if a passenger gets aboard is very small. The only extra expense in such a case is the little extra coal used in hauling his weight.

In many businesses—and especially such a business as electric service—most of the expenses are the same whether any particular customer uses the service or not, and it is only certain small expenses that are necessarily part of the cost of each customer. These latter are sometimes grouped under the general term "increment costs"—the cost incurred by adding that customer to the system, or saved if he is disconnected. The remaining and greater portion are "joint costs," which belong to the customers as a whole.

Increment and Joint Costs

Increment costs should be apportioned to individuals or the special classes that cause them.

Joint costs must be divided between all the customers. Here the question is, How much of the cost of the calf shall be paid by the purchaser of the veal and how much by the purchaser of the hide?

No absolute accountant's line can be drawn between increment and joint costs. For instance, in railroad freight, suppose a given traffic goes south. So long as cars come back empty the increment cost of extra freight north is only the handling and a little coal. All the rest is joint expense to be divided in some way among all the traffic. The moment the traffic north becomes big enough to require extra trains, then the increment cost in that particular case is high, and at that moment increment cost for freight in empty trains now going south becomes small.

It follows that the increment cost incurred by a customer is usually very small, unless we can be sure that he is always the "straw that breaks the camel's back." The fact that he happens to cost a great deal should not be charged against him unless it is always going to require that extra expense to serve him. Unless he, or his class, is always going to involve an expense, it is a joint cost and not an increment cost.

Division of Joint Costs

It is important to remember that for electric companies and most public services these joint costs are by far the most important portion of the total expense. It makes little difference to an electric company whether a particular lamp or motor runs or not, for the effect on 90 per cent of the expenses would be practically nil. These joints costs must be divided in some way between the customers that jointly use the service.

The simplest method is to select some unit, as the kilowatt-hour, and divide all costs in proportion thereto. Here there is no difference of interests as between owner and public in choosing the unit, but there will naturally be a difference as between portions of the public. Whether an electric company charges per lamp connected or per kilowatt-hour makes a great difference as between stores and residences, even though the rates are such that the electric company gets the same return on its whole investment.

Now, a class, like an individual, might possess the power to bribe the managers or to exert improper influence. But this case is so rare that it is a fair assumption that when the government establishes one rate for letters and another for books, when a telegraph company makes one rate for regular telegrams and another for night letters, when an electric company makes one rate for motors and another for lamps, these differentials are made in the interest of the public as much as in the interest of the corporations. Why, if the rate of return is fixed, should the owner make class differentials except to do more business at the same rate of return? And is not this just what the public wants him to do? Or, even if these differentials do increase the rate of return, is not this for the ultimate public advantage by making possible reductions of price that would not have been possible otherwise?

Every business, beginning with Uncle Sam's, makes these classifications or class rates, the results of which are undeniably good. There is, however, a feeling that these classifications are necessary evils that should be allowed only as a temporary expedient. Simplicity is, of course, an advantage, if not gained at too great a cost, but a certain school of thought has lately taken to laying undue emphasis on the evil side of classifications of rates, without realizing the absolute necessity of the classification or the great injury that would result to the public if it were given up, and in most cases these attacks on classification of rates have been merely a cover for attacks on company's profits.

Analysis of Rate Systems

The various well-known formulas for analyzing costs, such as the "demand" method, etc., are most useful tools in considering what may be the effect of changes in the business, but obviously a complete analysis would involve a tremendously complex formula. Cost per kilowatt-hour, for example, does not take into account the fact that underground service costs more than overhead. A complete formula would have not one or two but possibly hundreds of terms; and, no matter which formula is used for analyzing costs, it is still true that most of the costs are joint costs not necessarily incurred by any particular customer or customers.

The best result will be obtained, of course, when the burden on the customers is least; that is, when the central station gets as much business as possible over which to divide the joint costs so that the burden on each customer shall be least.

In any case it is obvious that the rate made for the new business should take as much of the joint costs as it will stand. This is clearly no injury to the new business, because it need not take the supply unless it wants to and will not unless it gets some advantage. On the other hand, if new business were asked to share the proportion of joint costs paid by the old business, it might not be secured at all and then would not pay anything toward joint costs, instead of paying something.

Central Station and Isolated Plant Costs

In a recent article in the engineering press, it was stated that the central station's operating costs are 1 cent per kw-hr., although the real cost is usually less. The general expenses are taken at 2.5 cents per kw-hr., probably including accounting and distribution expenses, maintenance of lines, etc. The article does not give figures for the fixed charges on the central station, but says that they are three times what they would be for an isolated plant. Later it gives the latter as 2 cents per kw.-hr., making the charges for the central station 6 cents per kw-hr. and the total central-station cost 9½ cents per kw-hr.

Then the costs of an isolated plant are given as: Operating cost, 1 cent to 1.5 cents per kw-hr.; fixed charges, 2 cents per kw-hr.; general expenses nothing; total, 3 cents to 3.5 cents per kw-hr. It is, of course, absurd that an isolated plant has no general or supervision and management expenses and that such services should not be included in the cost.

The costs for the central station, however, are the average costs, made up of all sorts of expenses, and because they may average 9.5 cents it does not mean that service for each new customer will also cost 9.5 cents. Each new customer may add something to the total costs, but this addition will have no relation to the average cost of serving the old customers.

Customer's Demand Used as an Index

Naturally the new customer should contribute as much as possible to joint costs, being made to pay "all his traffic will bear," even if he is charged as much as the others. Now, in order to determine what he can actually afford to contribute toward joint costs, it is necessary to figure what it will cost him to make electricity himself, and in most cases like this the things which determine his costs are his demand, his consumption and his size. In other words, we may use as a basis to figure his costs the demand formula above referred to. Hence, in publishing a rate to attract these customers, it is natural to make it on a demand basis, so that each shall pay as much as possible of the joint charges and reduce their burden on others.

But while the demand system furnishes a measure of the total station costs, it is not for that reason that it is used in making prices, but because it furnishes a measure of the value of the service to the customer. If in any particular case the demand system did not furnish this measure, we might use some other measure in order to apportion to him as much as possible of the joint costs, so that the supply to him should be of the greatest benefit to the other customers. Thus even when there is no question of the customer making his own electricity, the demand theory is still apt to furnish a measure of how much the new business can contribute to joint costs.

There is sometimes difficulty in understanding why a large customer can be supplied at so much less than the average price, but another analysis may make it clear.

The central station could build a new small station for a customer close to his mill, duplicating his plant, and by runnig it exactly as he would run his plant could meet his costs exactly. Then as a next step by combining the loads it could effect a saving and make a profit. In any case it could not lose, because even in the worst case it would operate exactly as the customer would have operated.

Basis of Value of Electric Service

The value of electric-light service is not what one would pay for electric light rather than go without electric light at all, but what he would pay that particular company for the service rather than get an equivalent service in some other way. The value of the service is never above what a competitor offers it for, and regulation of prices is merely to determine what the value of the service from the company in question would have been if no monopoly had been granted; in other words, what the company would have charged in the long run if subject to competition.

Whenever the return on investment is higher than is reasonable and equitable, competition will naturally spring up, and the authority that grants the monopoly requires that there shall be a reduction of rates applicable to those classes whose price would have been reduced by such competition. Subject to this exception, each price should be such as to produce the greatest amount of business and make the burden of joint costs least. The final result will be obtained by basing all rates either on actual value of service or on what this value would be under free competition. This results in practice in a simple, general rate such as obtains in most of our cities, with special classifications for power use and for large customers, etc.

It will be for the interest of owners, as well as of the public, to adjust rates along these lines, and if rates are made public and open to all alike, under like conditions, and so long as these conditions are made in good faith and without ulterior motive, any such proper discrimination in rates is justified and should inure to the advantage of the public as a whole.

Adjustment of the Differential

If the differential is between customers or classes who compete with each other, the burden of proof should be on those who propose or advocate the differential, and it should not be allowed unless it is shown that it is necessary, and then it should be no greater than necessary. The differential between large and small customers is of this nature. It is necessary, and in fact it would be better for the small customers if the differential should be made even larger, so as to get the big users to contribute something toward joint costs, instead of nothing, as happens when they do not use the service. But the differential should be watched carefully, because an error in adjusting it will merely transfer business from one class to another without really producing new business.

One rate for residences and another for stores would never transfer business and would seldom be open to criticism. On the other hand, one rate for two-family houses and another for single houses might transfer business from one to the other and in general might be undesirable. One rate for ice making and another rate for water pumping would hardly ever transfer business and hence is fully justified. But one rate for drug stores and another for saloons would be apt to transfer business. A rate for newspaper offices different from that for ordinary printing offices would again be subject to suspicion. On the other hand, the rate for hotels might be different from that for factories without much chance of any transfer of business.

Rules for the Company and for the Public

The following rules will show how the methods already mentioned can and should be applied:

For the Company.—Adjust the rate to various classes so as to get the greatest volume of business among which to divide joint costs. In order to do this, first make sure that no class is supplied at a loss and that each class bears as much as it can contribute (or would have paid under free competition) toward the joint costs. This means making the rates proportional to the value of the service less the savings due to monopoly.

This should result in a single general rate for the general public at least as low as would have obtained under free competition.

It should result in class rates for motors, street lighting, charging of batteries, cooking, etc., lower in many cases than the general rate, and should result in differentials for large customers, all of these class rates and differentials being only as low as necessary in order to get the business.

The differentials for large customers should be low enough to get the business now done by isolated plants.

For the Public.—Allow the company to make any change it likes as between customers or classes who do not compete with each other.

When a change is proposed which makes a difference between customers or classes that do compete with each other, allow the change only when it is clear that the result will really produce new business and not merely transfer business between competitors.

When the rates produce more than a fair return, provide for reducing the rates to those classes which would have obtained a reduction if competition had been free.

This is the line along which companies are now developing. The only weak point in their present situation is that they are not making the differentials in favor of large customers (and of certain uses, such as cooking, etc.) large enough to get the business. The result is that the small customers now pay more toward joint costs than would be necessary if the rates for big customers were made low enough to shut down every isolated plant whose owner knew his costs and was not running it for his own pride or amusement.

Illumination and Wiring

Minor Inconsistencies in the National Code

Some of the minor inconsistencies in the National Electrical Code for wiring construction were brought out in the discussion at the recent convention of the Western Association of Electrical Inspectors at St. Louis.

In conduit systems, for example, the rules require No. 12 gage junction boxes but only No. 16 gage cut-out cabinets. It is also a general code requirement that No. 18 wire be fused at 3 amp, yet No. 18 flexible cord and No. 18 fixture wire are employed generally without such restriction. Discussion at the convention led into arguments both for and against legitimatizing this small size of wire, since as pointed out by those opposed to its use final lamp sockets are now very readily and generally utilized for the connection of household appliances having high rates of energy consumption.

Early practice, as the discussion brought out, contemplated short-circuit protection in allowing a 6-amp fuse to protect No. 18 cord or No. 18 fixture wire, both of which were then permitted for supplying single lamps. The use of household devices, however, now involve loads considerably larger than that set by the National Electrical Code table as a safe limit for No. 18 wire.

A Comparison of Direct and Semi-Indirect Lighting

At a recent meeting of the Illuminating Engineering Society in London some interesting photographs which had been taken by artificial light were shown by Mr. V. H. Mackinney.

Two of these photographs represent the same room. In Fig. 1 it is illumined by a cluster of tungsten lamps in holophane reflectors. The other illustration (Fig. 2)

FIG. 1—DIRECT ILLUMINATION WITH TUNGSTEN LAMPS

shows the room lighted by tungsten lamps in a holophane inverted prismatic bowl. The amount of light given to the lower part of the room with the semi-indirect lighting fixture is distinctly less than with the direct system of illumination, but the distribution is much better. It will be noticed that the shimmer of the tablecloth under the direct lighting is apparently more marked, but that the semi-indirect unit still gives a certain amount of shimmer. Semi-indirect lighting is not entirely shadowless. It has been computed that this unit reflects about 75 per cent of the light upward and transmits practically all the remaining 25 per cent downward into the room as direct light.

The effect of the semi-indirect unit is distinctly soft and restful. The group of three reflectors shown in Fig. 1

FIG. 2—INDIRECT ILLUMINATION IN THE SAME ROOM

stands out quite sharply, but there is nevertheless a slight haze around them, analogous to glare. The semi-indirect unit is shown clearly and distinctly with no trace of glare. Neither of these two photographs has been retouched in any way, and both were taken by the artificial light of the tungsten lamps alone.

Indirect Illumination for General Offices

At the meeting of the Chicago Section, Illuminating Engineering Society, Jan. 15, Mr. J. P. Malia, chief electrician of Armour & Company, Chicago, and Mr. T. H. Aldrich, supervising engineer of the National X-Ray Reflector Company, Chicago, presented a paper on indirect illumination for general offices, discussing in detail the extensive tests made prior to the selection of a new system of illumination for the offices of Armour & Company at the Union Stock Yards, Chicago.

There are 1200 employees in these offices, the total floor area being 113,750 sq. ft. Most of the office space consists of large open areas, but there are twenty-eight private offices. In arranging these rooms much attention was originally given to provisions for natural and artificial lighting and ventilation. The walls and ceilings are covered with a light-colored matte-surface paint, while on the side walls a light-green tint extends up to a line 7 ft. 9 in. from the floor. The ceilings are 15 ft. 9 in. high.

The former system of illumination employed Nernst lamps on a distributed-outlet system with four outlets per bay in bays about 17 ft. by 19 ft. This lighting required 2.1 watts per square foot. It was decided to change this system because of the employees' dissatisfaction with the lighting, the inconvenience of frequent lamp outages, low illumination efficiency compared with tungsten lamps, and the high cost of renewals and cleaning.

Three kinds of lighting were given thorough trials. These were: (1) Indirect lighting with one-piece corrugated

mirrored reflectors; (2) semi-indirect lighting with a light-density opal reflector turned upward, and (3) indirect lighting using white-enameled steel reflecting bowls.

Trial installations of the three systems, direct, semi-indirect and indirect—were made in December, 1911, and January, 1912, and were kept in operation for six months before decisions were made as to the system to be adopted. During that time numerous tests were made for illuminating efficiency, using two Sharp-Millar photometers, frequently calibrated at the Armour Institute, to determine the average illumination. A bay near the center of the office space was chosen for the average illumination tests.

Illumination efficiencies, or the percentage of lumens generated which was found effective on a horizontal plane 34 in. above the floor for the three systems, were as follows: Direct (satin-finish, prismatic, concentrating), 55 per cent; semi-indirect (light-density opal), 50.7 per cent; indirect (mirrored reflectors), 38 per cent.

Tests for depreciation in illumination caused by dirt were also made after several months' use. These tests showed that the depreciation caused by dirt is practically the same for all three of the systems examined, and under the conditions of this office it averaged about 10 per cent per month. Mr. Aldrich stated that he had found similar results in a large office building on Michigan Avenue, Chicago.

Some interesting tests were made on the time required to clean lamps and reflectors. The lighting unit consisted of one lamp and its reflector in each case. The time of one man required per unit, for a run of thirty-six units, was as follows: Indirect, 2.25 minutes per outlet; semi-indirect, 6 minutes per outlet; direct, 6.5 minutes per outlet. This difference was partly due to the mechanical arrangements of the various units and partly to the prisms or creases on the direct and semi-indirect reflectors.

The committee for Armour & Company in charge of the proposed change consisted of the general office manager, assistant office manager, superintendent of motive power, assistant superintendent of motive power, and chief electrician. After considering the opinions of the employees working under the different systems, the cost of operation and maintenance, and first cost, the committee decided unanimously in favor of the indirect system. There was less than 7 per cent difference in the installation costs of the three systems proposed. It was found that even though the intensity in foot-candles was lower with the indirect system, it was preferred by the employees. This was attributed to the diffused character of the light, making shadows and the glare from paper surfaces less prominent than with the other systems under test.

The average illumination from the indirect-lighting equipment, with the reflectors and lamps clean and new, was 3.76 ft.-candles. Under average working conditions this illumination is, of course, lower. About 1.25 watts is expended per square foot.

In conclusion it was pointed out that in large office spaces of this kind, with ceilings from 13 ft. to 16 ft. high, considerable saving in wiring would result by having one outlet per bay instead of four, and that by hanging the lamps and reflectors lower the light from each reflector could be made to cover the area of the whole bay. Such an arrangement would also look better. Lamps of 400-watt or 500-watt sizes could be used, instead of 100-watt units, thus increasing the efficiency and lowering the renewal cost.

Discussion

In the discussion Chairman F. A. Vaughn, Milwaukee, questioned the advisability of using one outlet per bay for office and drafting-room lighting of this kind. For such places he thought the more diffuse the light the better, the ideal condition being a uniformly illuminated ceiling. Dr. M. G. Lloyd, Chicago, called attention to the fact that reflection from the ceiling follows more nearly the laws of diffuse reflection than the laws of specular reflection.

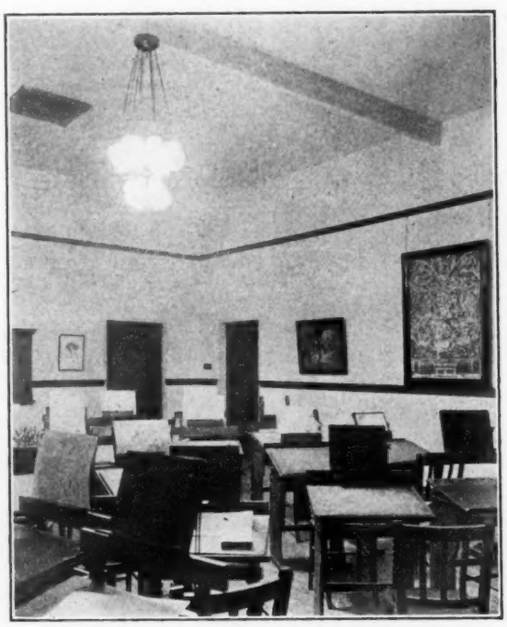
Mr. J. R. Cravath, Chicago, agreed with Mr. Vaughn that approximate uniformity of ceiling illumination is desirable for general offices in order to minimize the two things most to be avoided in office lighting—namely, glare from paper and sharp shadows. These two features were responsible for the great popularity of indirect lighting among employees, though often the true reasons are not appreciated by the manufacturers or the users. By hanging indirect fixtures low enough with very high ceilings, reasonable uniformity of ceiling brightness might be obtained, but in general the plan of using one outlet per bay should be applied with much caution for office lighting. If the very best results in comfortable illumination and the highest human efficiency are sought, one can afford to sacrifice some illuminating efficiency, but, of course, it must be recognized that the illuminating efficiency is lower if the ceilings are made relatively bright around the edges. This is simply the price one must pay for the best results.

Mr. Vaughn questioned the desirability of wall colorings mixed with oil because they are more glossy than calcimine. Mr. Aldrich replied that paints can be obtained which do not give a glossy surface, and that paints are becoming popular because they can be washed.

Mr. Malia in conclusion emphasized the point that all of the men working under the indirect system chosen preferred it to the others.

Lighting an Art Room

The special conditions which present themselves in the illumination of rooms to be used by art classes in molding, drawing, etc., are always matters of keen interest to the illuminating engineer. The illustration presented herewith shows such an installation in the art room of an English school. One of the most important problems in this case was the arrangement of shadow. There has been considerable controversy as to whether indirect lighting is suitable in such cases or not. It has been maintained by some engineers that the effects were nearly shadowless, while others contend that the shadows are present but are soft and agreeable and resemble daylight.



ILLUMINATION IN ART STUDIO

The kind of shadow desired by an artist may be expected to vary according to the subject. A recent article in the

Illuminating Engineer (London) describes a method of lighting art rooms at the Training School College in the city of Leeds and pays careful attention to this point. The method of varying the shadow consists in using a collection of tungsten lamps in holophane globes hung from the ceiling. As a rule, the model sketched by the students is placed immediately under the chandelier, so that it may receive the brightest light in the room. The switching arrangements enable four, eight or twelve lamps to be lighted. In this way the illumination can be varied between wide limits and the intensity and abruptness of the shadow may be adjusted. In the room shown in the photograph a collection of twelve tungsten units is employed, and with all lamps lighted an illumination of 15 ft.-candles is obtained immediately under the light.

Requirements for Proper Grounding

The thoroughness of the ground connection established is of prime importance, said Mr. W. J. Canada, engineer for the Rocky Mountain Fire Underwriters' Association, Denver, Col., in discussing the grounding of secondaries before the recent convention of the Western Association of Electrical Inspectors at St. Louis.

The "ground" must be of such size as neither to burn loose in case of dead ground on opposite primary nor to deteriorate from the passage of such current as the blowing of the largest primary fuse may necessitate. Failure to blow the fuse must, of course, subject the secondary to some voltage rise. If 200 amp be taken as about the largest primary fuse in any given system, the ground on that feeder should easily accommodate that current.

Since the grounding should be permanently good enough to prevent more than, say, 25 per cent voltage rise on the secondary, it is evident that with 200 amp flowing from a primary-secondary contact to a ground 500 ft. away, at least No. 4 ground wire and neutral would be necessary. A No. 6 wire would cause a 40-volt rise. Resistance in the ground connection, even as small as 1 ohm, would cause a 200-volt rise which might readily be dangerous and certainly does not accomplish the full purpose of grounding.

It seems quite evident that for real protection primaries must be generally much smaller than of 200-amp capacity, or, far better, that grounds on secondaries to this primary should be in such numbers and thoroughness as to give much less than 1-ohm resistance. The large proportion of companies using driven-pipe grounds would indicate that these have given absolute satisfaction in these respects, were it not that a majority of these very companies state their distinct preference for the ground to water mains, as being more thorough and rugged.

One engineer representing a large number of important operating companies writes: "Ground plates are better than nothing, but the ordinary connections to water mains if properly made are entirely satisfactory, and driven pipes can be made satisfactory where soil is moist and where enough pipes are driven."

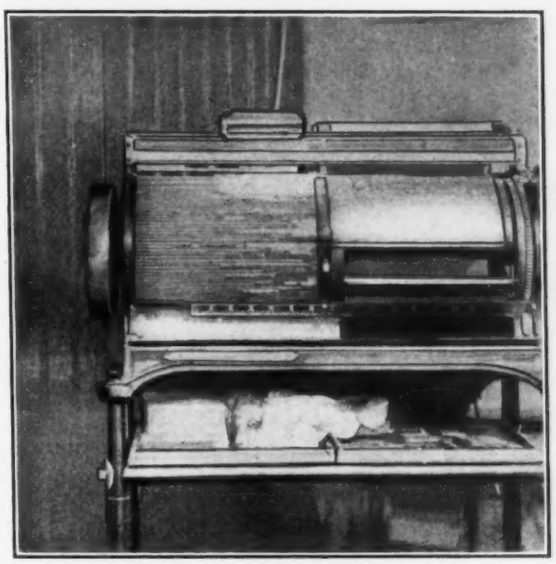
Many in substance write: "We regard grounds to water pipes as very desirable, but they are not permitted by our water company." Others add: "We use driven pipes [or cones, or plates]. These methods are not highly satisfactory, but we feel that by placing such grounds close enough the combined effect of all gives us a decided element of protection." A few companies claim to find their practice of grounding secondaries frequently to rail returns satisfactory protection.

It generally appears that in very wet places the driven-pipe ground, if in sufficient numbers and well spaced, will give the necessary low resistance and fair life. In all other cases, and especially where few grounds must be depended on for protection against crosses with heavy primaries, the water-main ground is without rival. Such cities as Denver or Los Angeles could not get effective service from other forms of ground. Only the best available grounds should be made, since the neutral may, by a direct cross with the primary, be raised to a sufficient potential above water or gas pipes in buildings to cause fire—and indirectly life—hazard, by break-down in such piping systems or by high resistance contacts with them.

Another difficulty, rare but still to be considered, is that caused by small grounds such as pipes, cones or plates, even though reasonably numerous, in locations where soil freezes to a considerable depth. In this case the earth surrounding the "ground" becomes practically an insulator. The grounding loses its value, and in the event of surface thaw severe shocks have been given between this poor ground and the better-conducting top surface.

Adapting a Portable Lamp to a Multigraph Machine

The accompanying illustration shows a multigraph machine used in a small typewriting office without natural light, the machine having been equipped with an 8-cp tungsten lamp to improve operating conditions. The lamp was placed in a small fixture carried under a shade by a clamp attaching it to the machine frame. A cord and plug enable the device to be used at any point on the premises.



PORTABLE LAMP ON MULTIGRAPH

When adjusted for service the lamp provides good illumination on the working field of the machine, with practically no glare in the operator's face. Both the comfort of the attendant and the speed of his production have been materially improved by the use of this subdivided local illumination. The cost of operation is about 1 cent per day.

Recent Telephone Patents

PAY-STATION COIN-COLLECTOR SYSTEM

In recent years there has been developed a pay-station system employing coin collectors wherein a coin must be deposited before a signal can be given to the operator. These are known as prepayment stations. They must have a means, under control of the operator, for causing a coin to be collected or returned according to the result of the call. A patent granted to Mr. A. F. Dixon, of New York City, describes a prepayment pay station collector adapted for coins of several different denominations. The device has a single slot to receive all coins. Any standard coin will

operate the signals. After a coin is deposited a lever is pulled, which causes the coin to be gaged by a coin plate, and if it is of a standard size contacts will be made to signal the operator. The coin then will be dropped to an intermediate receptacle. The operator responds and returns the coin and asks for the proper deposit. This is necessary as the operator is not upon the line to check the code signal indicating the denomination of the coin at first. As the coins are now dropped and the lever pulled, a code wheel is set in motion which indicates the denomination. Each coin must be disposed of from the intermediate receptacle. This is accomplished through a polarized electromagnet, responsive only to special currents introduced by special keys. Current of one polarity sends the coin to the hopper, while current of the opposite polarity sends it to the return chute. This patent is assigned to the Western Electric Company.

Telephone Circuit Systems

Mr. E. R. Corwin has had six patents granted to him for circuit systems. Four of these patents relate to a system employing automatic ringing and listening cord pairs. By this is meant that the usual manually operated ringing and listening keys are superseded by relays. When a connection is to be put up the answering cord is plugged to an answering jack in the usual way, and the operator may immediately talk to the calling party. When she has learned his wishes and plugged to the desired number, ringing continues intermittently until response, or for a predetermined period. The ringing relay is controlled by a lock-out relay for cutting off the ringing current, and this latter is in turn controlled by the called-party supervisory relay. In another system a motor is used to control the maximum duration of the ringing period, which is terminated when the motor has made a certain predetermined number of revolutions. Of the other two patents, one describes a particular arrangement of busy-test circuit employing a split induction coil with a split receiver connected to its middle, the receiver in turn having its middle terminal grounded. The other patent describes an interchange trunk terminating in a plug at one end and in jacks at the other. The trunk has a condenser in each side of its line so as to provide for a talking circuit without metallic connection between the two ends.

Sectional Switchboard

While heretofore all large telephone switchboards have been built up of sections placed end to end, each section has in itself been of considerable size and on this account it has therefore been customary to build special sections to meet the demands from small plants. Recently the idea has been conceived of producing small unit sections,

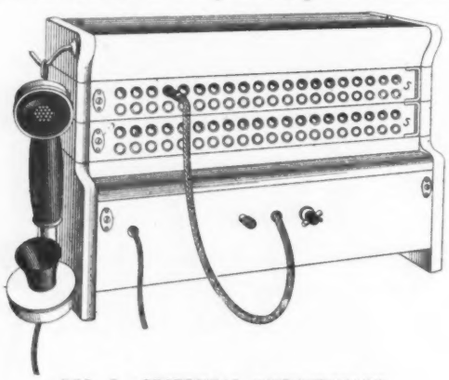


FIG. 1—SECTIONAL SWITCHBOARD

which may be built together after the manner of a sectional bookcase to meet the demands of these plants. It is such a unit switchboard that is described in a patent issued to Mr. E. S. McLaren, of East Orange, N. J. The patent is assigned to the Western Electric Company. An idea of the size of the sections is conveyed by the cuts, which show two views of the switchboard. It will be noted that the base section carries the cord and operator's equipment, while the line sections bearing various standard equipments

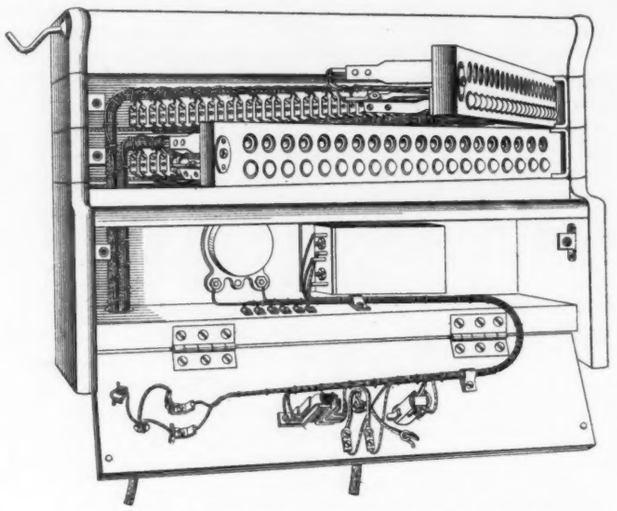


FIG. 2—ARRANGEMENT OF WIRING AND SECTIONS

may be piled upon this, one upon the other, until the desired capacity is reached. The board is surmounted by a top section, as shown in the illustrations.

Letters to the Editors

European Wiring Practice

To the Editors of the Electrical World:

Sirs:—Mr. A. H. Bernhard's article on "European Wiring Practice," which appeared in the Jan. 11 issue, calls for some comment. Not being personally acquainted with French and Italian practice, I cannot comment intelligently on the construction work of either country, so that my criticism will be limited to Austrian and German practice, which are almost identical. The centralization of fuses on panelboards and the fusing of every 6-amp lamp circuit has been standard practice in both Germany and Austria for the last two decades. In the case of movable lamps or fixtures, however, a second double-pole fuse is called for, which is oftentimes installed in the ceiling rosette. This additional fuse is required because of the greater possibility of trouble in lamps which are movable. Other peculiarities in wiring are found in residences the walls and ceilings of which are covered with valuable paintings or tapestries. In such dwellings the mains are run in the corridors and the fused conductors leading to the chandeliers are brought in through the walls and are not supported by knobs or any other medium to the ceiling, but are draped between the outlet and the chandelier. The switches controlling the lamps are located either outside the door in the corridor or on the chandelier itself, and the fuses and mains in the corridor are properly covered. Dead wires are symmetrically draped in the room with the live wires leading to the chandelier so as not to mar the artistic arrangement of the room. Wooden molding is expressly prohibited, as is also the common practice in this country of having the conductors sustain the weight of the lamp and fixture. In Germany and Austria a suspension wire is used in addition to the two conductors, and its function is to relieve the conductors of the weight of the lamp and fixture. In both countries the rules promulgated by the engineering societies are strictly enforced, and trouble or fire from short-circuits is almost unknown.

Schenectady, N. Y. L. Lustig.

Variations in Wireless Signals

To the Editors of the Electrical World:

SIRS:—It is possible that your readers will be interested in the following four suggestions concerning the causes for the well-known daily variation in wireless telegraph signals:

First—That the current transmitted in wireless communication travels over the surface of the earth as a static charge, setting up an electromagnetic field in the air above, exactly the same as the field of force around an ordinary conductor carrying the same kind of charge.

Second—That the real regulating factors in wireless transmission are to be found by an investigation of solar, terrestrial and nocturnal radiation, and of convection currents.

Third—That a careful investigation of the "dew point" of the air at the transmitting station and at different points between the transmitting and receiving stations will show that the upward and downward radiation of vapor, as the temperature fluctuates around the dew point, will correspond with the greatly fluctuating strength of signals during darkness.

Fourth—That at or near sunset, at a given transmitting station, there is a short period of time when the atmosphere is in a stable condition—that is, without any circulation or radiation either upward or downward—and this condition may be the cause of the great increase in energy transmission noticed daily at this time.

WALTER N. FANNING,
Vallejo, Cal. Chief Electrician U. S. Navy.

The "Kelvin" and the Kilowatt-Hour

To the Editors of the Electrical World:

SIRS:—An item in the *Digest* in your issue for Jan. 25 calls attention to the proposal to give the name "kelvin" to the kilowatt-hour, a proposal that has not proved acceptable to many engineers and scientists wishing to honor Lord Kelvin.

It is well known that Lord Kelvin was one of the main founders of the c.g.s. system of units, as well as of their decimally related prototypes in the practical, or ohm-volt-ampere, system. Electrical engineers all the world over will agree that his name is certainly entitled to a permanent place in electromagnetic units. It may be taken for granted that not only the Americans, as part of the English-speaking peoples, but also electrical engineers in all countries, desire to see an honorable place given to the name of "Kelvin" in electrical metrology. Moreover, no action in the matter can give universal satisfaction save international action because such a man belongs to international science and to the whole world, rather than to any one country. Such action should, therefore, be considered from the international standpoint.

It will be remembered that at the international electrical congress of 1889, in Paris, the "joule" was adopted as the practical unit of electrical energy and the "watt" as the unit of electrical power. These were ratified by the Chicago congress of 1893 and by other congresses since that date. If we possessed a decimal division of time, it is reasonable to suppose that the joule, perhaps with the aid of decimal prefixes, would have been introduced into the electrical industry. But the fact that we all inherit a sexagesimal system of time prevented the joule from coming into industrial use, the watt-hour having been speedily adopted, by common consent, in many countries, without any formal recognition from international congresses. The dials of a large number of energy meters in service bear the word "watt-hours," and such meters are commonly called "watt-hour meters." Since, however, the watt-hour, equal to 3600 joules, is a relatively small unit of energy, decimal derivatives came into use, notably the "kilowatt-hour" in Great Britain and North America and the "hectowatt-hour" in France and some other European countries.

In 1890 the English Board of Trade took up the question of industrial electrical meters and standards. It appeared inexpedient at that time to introduce the name "kilowatt-hour" into British practice. That unit was retained, however, under the title "Board of Trade unit." This name has not given general satisfaction, partly because it is not self-explanatory and partly because its common abbreviation, "b.t.u.," conflicted with that of "British thermal unit." In 1892 an attempt was made in England to apply Lord Kelvin's name to the kilowatt-hour. The attempt met with very little success, although the "kelvin" was adopted in provisional orders by the Board of Trade about that time, and has never been withdrawn so far as we are aware. A few engineers in England continued to use the "kelvin" as the name of the "kilowatt-hour" of electric energy, but the term fell into desuetude. Very recently the suggestion has been revived in Great Britain.

In all countries except Great Britain and her colonies the watt-hour and its decimal brother—the hectowatt-hour, kilowatt-hour or myriawatt-hour—are well established in industry, and they are systematic and self-explanatory. It is open to question whether it would be possible to substitute the "kelvin" for the "kilowatt-hour" in the United States, however desirous the American electrical engineers might be to join any international movement for that purpose, so firmly is the kilowatt-hour now rooted in American literature, commerce, usage and law. Perhaps this very real difficulty in America might also be encountered in other countries. If it was not easy to make such a change in England in the *fin-de-siècle* days commencing with 1892, with no very strong leaning to the "Board of Trade unit," and with a juvenile industry, how much greater would be the difficulty at this time, with a large industry and the watt-hour well established!

Assume, however, that the change could be effected in all countries, and consider merely the merits of such a change. In the first place, all of the other internationally accepted units—ohm, volt, ampere, coulomb, farad, joule, watt and henry—stand each for a unit in the practical system. The "kelvin," used as proposed, would be the first name assigned to a decimal multiple of a unit. It would not represent the unit of energy in that system—which is already denominated the joule. It would not even represent the industrial unit of energy, first cousin to the system—the watt-hour. It would merely be a synonym, or abbreviated alternative, for a thousand watt-hours. Its use could not drive out the watt-hour. We should all have to learn, teach, grasp and remember the watt-hour, as part of the whole system, and then we should have to remember, by an additional mental effort, that the "kelvin" was the name adopted internationally for the "kilowatt-hour." Is not this a derogatory function for the great name of Kelvin? The other units of the system fill a need for a name. Thus, without the ampere we should probably have to speak of either "coulombs per second" or "volts per ohm." The established units economize mental effort. But the "kelvin," used as proposed, while it would replace a four-syllable word by a two-syllable word, would not fill a gap in the system and would cause unnecessary mental effort. If we should take the "kelvin" as a unit of energy, it should be for the "watt-hour," or basic industrial unit, and we should use the "kilo-kelvin" instead of the "kilowatt-hour." There would be no particular economic advantage in so doing; but at least it would be a logical and systematic proceeding. It would also avoid using Kelvin's name for a mere abbreviation of a decimal multiple to a fixed unit. Besides, if the industry advanced to larger units in the future, such as the myriawatt-hour, the change would not then displace the kelvin.

Louisville, Ky. JAMES GRAY.

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Distribution-Line Construction Problems

Construction and maintenance troubles may be considered almost reciprocal, said Mr. C. R. Phenicie, general superintendent of the Wisconsin Public Service Company, before the Wisconsin Electrical Association at its recent convention, for if careful and first-class work has been done on original construction, the problems of maintenance will be comparatively easy, becoming little else than a regular inspection of the system for a number of years at least. Mr. Phenicie then went on to enumerate some of the details which, in his opinion, make for the best construction.

Considerable care and effort is warranted, he said, in keeping the phase relation the same throughout an entire distributing system. Arc circuits, primary single-phase lines and three-phase lines should always occupy the same relative position to each other whenever they appear on the same pole lines. The line carrying the highest voltage should be at the top of the pole. Circuits carrying more than 5000-volt pressures should never be placed on the same arm with other circuits, and, if possible, not on the same arms with each other.

Liberal climbing space should always be allowed on poles, not only as a means of safety to workmen but from the fact that this arrangement allows future space for transformers, fuses, lightning arresters, etc., to be placed along the line.

Transformers supplying motor service should be of the three-phase rather than the single-phase type, declared Mr. Phenicie. The result is a saving in both cost and weight and means higher efficiency. The author also believes, although aware that there is much difference of opinion, that transformer secondaries may profitably be banked together, even though the transformers themselves may be located a considerable distance apart. Better regulation is obtained, he said, and copper investment is decreased.

Mr. Phenicie also insists that with modern transformers a fixed rule of using should be adopted. It is the Wisconsin company's practice to fuse each transformer to one and a half times the normal full load of the transformer in amperes, although practice varies with different companies. However, it is never advisable to allow a repair man or lineman to put in the fuse which he happens to have in his pocket, even if at the risk of continuing an interruption a few minutes longer. It is considered good practice to step each transformer pole to the ground and to place the cutouts so they are at the lowest point on the pole of the circuit of which they form a part.

Never place primary and secondary wires on the same arms, added the speaker, even though additional crossarms, meaning additional expense, are necessary. Primary and secondary wires on adjacent poles are liable to give patrons a pyrotechnic display in their homes that they will not in the least appreciate and for which they may demand payment. Service wires into a customer's premises should be carefully spaced. These service wires will necessarily be placed with considerable slackness or sag at times, and since this is the case correspondingly greater care should be given to spread them properly, although the speaker argued against buck arms for this purpose. Buck arms are weakening and disfiguring at the best for line structures and should be avoided except for right-angle turns of the lines themselves. For service wires some of the malleable-iron galvanized spreaders should be used, many types of which are available for this purpose. Avoid boring holes in poles and arms as much as possible, added Mr. Phenicie, and whenever a device with sufficient holding strength can be found to take the place of a bolt or pin it should be used.

Oil-Piping Layout for Transformers Using Thin Oil

By Fred Buch

Pumping oil into water-cooler transformers or back to a storage tank without the use of an air compressor has been made possible by a new and very thin insulating oil recently placed on the market. With the thick oil, which is still used almost exclusively, air bubbles necessarily gather in the oil while it is being pumped into the transformer, and to draw these off a connection from the air compressor is fitted into the cover so as to create a vacuum. With the new thin oil no vacuum connection is required, the air naturally rising to the surface and escaping through the raised cover of the transformer. Moreover, since the thin oil flows more freely in the pipes the sizes of the supply and return headers may be reduced, 1-in. or 1.5-in. pipe being ample for even the largest systems. The oil is handled exclusively through the pump connected with the filter press and is pumped into the top connection of the transformer and drawn off through the bottom, the

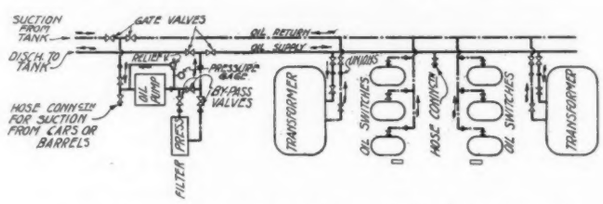


FIG. 1—LAYOUT OF PIPING FOR OIL SUPPLY AND RETURN

connections at the pump being arranged so that the oil may be pumped from the transformer to the storage tank direct, thus doing away with the overflow header formerly required for carrying off the oil. As this latter header was generally made of 4-in. pipe and ran practically the full length of the power house, it will be seen that a material saving has been made, both in cost of installation and in space.

Another advantage possessed by this thinner oil is that it can be used for oil switches and arresters, thus doing away with a storage tank. On former systems the oil-switch tanks were generally filled and emptied by hand, while now this may be done with the pump by simply providing connections with hose valves in the transformer headers.

Pump and Filter Press

The oil pump and filter press may be bought in one unit or purchased separately and piped up as required, care being exercised to have a by-pass connection, as shown in the diagram (Fig. 1). A pressure gage and relief valve should form part of the filter press outfit, and the relief valve should discharge back to the suction end of the pump, as shown, so that the latter can never get up pressure enough to burst the blotters in the press, the excessive oil simply returning to the pump. For a detailed description of the

press the reader is referred to the excellent bulletins now obtainable from the makers.

To get the simplest and most effective layout, the suction and discharge connections should be arranged as shown, the pumping connections thus obtained being as given in the following table:

TABLE OF PUMPING CONNECTIONS

Suction from	Discharge to	Via
Tank cars or barrels.....	Storage tank, transformers, oil switches	Pump only, or pump and filter press
Storage tank.....	Transformers, oil switches, back to tank, barrels	Pump only, or pump and filter press
Transformers.....	Storage tank, back to transformers, oil switches, barrels	Pump only, or pump and filter press
Oil switches.....	Storage tank, back to switches, barrels	Pump only, or pump and filter press

Thus it will be seen that any desired combination can be made by simply opening or closing a few valves at the pump.

Oil may be taken from tank cars or barrels through a 1-in. hose, for which a valve is provided at the pump, and discharged directly into the transformers or switches without being treated; or, if necessary, it may be run through the filter press and freed of all moisture and suspended matter as fast as it is taken from the barrels, the filter presses now on the market handling from 12 gal. to 18 gal. per minute at a maximum pressure of 120 lb. per square inch.

Oil may be pumped into the storage tank, treated or untreated, to be kept until needed elsewhere; it may be returned from the transformer or switches to the tank, or it may be taken from the transformer, treated and returned while the former is in full operation. All this is accomplished through two headers only—one for suction and one for discharge.

It will be noticed in the diagram (Fig. 1) that all suction valves have been placed close together at the suction end of the pump, and all discharge valves have been similarly located at the discharge end of the filter press. This is important, as it greatly facilitates matters for the operator. Were the valves more scattered, as is often the case, confusion might arise.

To insure correct manipulation each valve should be fitted with a brass nameplate designating whether it is a suction or discharge connection and what it connects. The suction valves and suction piping should also be painted a certain color up to the suction end of the pump, and the discharge valves and discharge piping should be painted

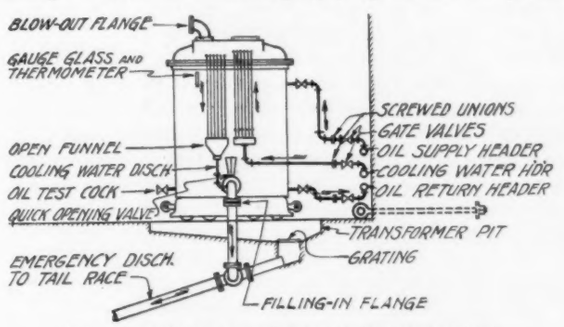


FIG. 2—DETAILS OF PIPING AT TRANSFORMER

another color from the discharge ends of the pump and filter press to their destination. With the system thus marked there should be no chance for error, as the operator can see exactly what connections he is making.

PIPING

The discharge line from the pump to the transformers and all piping through which treated oil flows should be made up of standard galvanized wrought-iron pipe and fittings, and the suction piping carrying the oil to be treated should consist of standard black wrought-iron pipe and fittings. Brass ground-joint unions and screwed valves should be fitted wherever required so that any part of the piping or apparatus may be easily and quickly removed or re-installed. All valves should be of the screwed-gate type.

The headers should be carried along the wall, if possible, so that they may be given a slight slope throughout and bleeder connections should be fitted at the lowest points to facilitate drawing. The wall should therefore be kept free from obstructions and the switch cells, etc., built several inches clear of it. Whether this can be accomplished or not, the headers should be run at the rear of the transformers so that the latter may be pulled out and away from the electrical connections for overhauling without interfering with the piping systems. Where the transformers rest on piers, the piping may be run below the rails, but where they are run on the floor level the pipes must be carried high enough above the floor to allow for the installation of the large U-bolt or I-bolt in the wall for pulling the transformers back into place. There should be enough clearance for the heavy block and tackle used in connection with the overhead crane for pulling back the transformers.

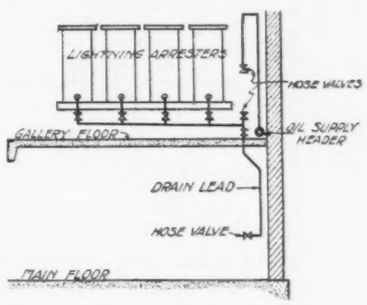


FIG. 3—OIL PIPING TO LIGHTNING ARRESTERS

All pipe connections to the transformers and oil switches should be made as flexible as possible and in a manner that will allow considerable adjustment in any direction because of the difficulty of re-connecting apparatus during re-installation. In re-locating a transformer, for instance, it will be found almost impossible to place it exactly as it stood before, even when jack screws are used. It becomes necessary, therefore, to make allowances for this and design the piping details accordingly. Fig. 2 shows the branch connections from the headers to the transformers taken out of the top and bottom of the lines instead of from the sides. A nipple and elbow are provided so that the connections may swing up or down about the center of the header and at the same time to the right or left without disturbing the headers, thus easily compensating for any misplacement of the re-located transformer.

The filling-in flange shown in the emergency discharge (Fig. 2) is also intended to overcome this difficulty. The pipe embedded in the concrete floor is absolutely rigid, and the large diameter and short distance from the center of valve to the floor line do not permit flexible joints. The transformer must therefore be "jacked" over until the bolt holes meet, and a filling-in flange and heavy paper gaskets soaked in oil are then inserted before the flanges are bolted. Four 1-in. holes for ¾-in. bolts are considered sufficient for this joint, as the emergency discharge is seldom used and the oil leaking through the joint will be carried off through the drain connection in the transformer pit.

The valves shown next to the transformer are furnished with the latter, as it is usually shipped from the makers full of oil. The valves next to the headers and the adjacent unions are necessary for two reasons: First, a transformer is usually placed under load as soon as it is in position and before the other transformers are located; second, a transformer may be withdrawn for repairs at any time while the system is in full operation, and in each case it becomes necessary to shut off the oil line. This also applies to the oil switches and lightning arresters as well.

Transformers

Transformers should be set on rails mounted on piers with a catch basin beneath, or the rails embedded in the floor surfacing and a pit built under the transformer to collect the escaping oil in case of an explosion. Each transformer should be inclosed in a separate fireproof chamber, and the piping connections should be made as just described. The large emergency discharge with the quick-opening valve on the transformer is piped into the tailrace as shown in Fig. 2, and the drain from the transformer pit is also connected into the same. Where the cooling water is wasted this, too, may be discharged into the same connection, as shown. The pipe in the line to the tailrace should be the full size of the quick-opening valve. It should have a good slope, be as straight as possible and free from valves so that it cannot be shut off under any circumstances. It is the purpose of this pipe to carry off the burning oil in case of fire or in case the transformer explodes, as well as to discharge oil that has become useless. The section embedded in the concrete may be ordinary soil pipe.

The transformers should be supplied with gage glasses, thermometer, electric alarm, a blow-out flange in the top cover and water-cooling coils of seamless brass tubing, as described in an article by the writer in the *Electrical World*, Dec. 7, 1912. If iron coils are used, special provision must be made to free the cooling water of air, as otherwise corrosion of the coils will be very rapid.

Lightning Arresters

Lightning arresters insulated with the transformer oil should not be connected to the transformer oil piping on account of the electrolyte which may spill and accumulate in the arrester tanks, especially if the latter are filled from the top. This electrolyte, if it once gets into the piping system, cannot be separated from the oil with the filter press and would ruin the entire system. A piping system similar to the one in Fig. 3 should be installed. With this arrangement the supply header is brought to a point at least 12 in. above the top of the arrester tank and then returned, a hose valve being fitted within easy reach. Another hose valve should be installed on the drain line, and when a tank is to be filled the two should be connected with a hose and the pump put in operation. Should the operator by chance open a wrong valve and thus permit the dirty oil from a full tank to flow back, there is no possible chance for the electrolyte to get into the supply piping on account of the loop rising above the oil level. When the connecting hose is removed the heavy electrolyte must necessarily fall out.

To drain an arrester tank, a barrel or other empty vessel should be placed at the outlet end of the drain line on the main floor and the valves opened. The valve in the drain lead, just above the gallery floor, should be used while

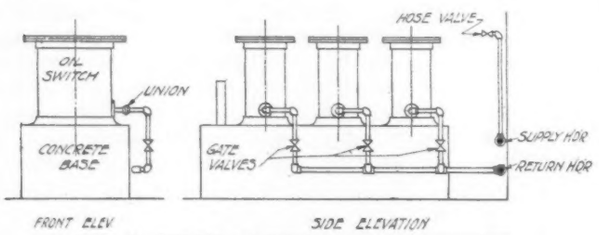


FIG. 4—DETAIL OF PIPING AT OIL SWITCHES

filling only, the idea being to keep it closed so that no oil can escape or be wasted down the drain lead. A hose valve at the bottom end is provided so that one man may drain the tanks alone, opening or closing the valve at will whenever a barrel is filled and thus eliminating all necessity of climbing to the gallery floor or keeping a man there to manipulate the valve.

No special provision need be made to make the pipe joints flexible, as the tanks usually rest on an angle-iron frame and, being accessible, are not likely to be disturbed once they have been put in place.

Oil Switches

Where transformer oil is used for insulating the high-tension transformer and line switches the supply connections to the latter cannot very well be made into the tanks

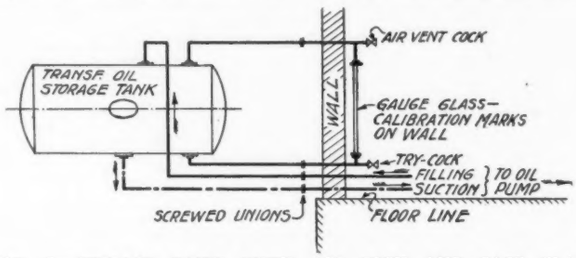


FIG. 5—STORAGE TANK WITH AIR COCK AND GAGE GLASS INSIDE OF POWER HOUSE

directly on account of interference from electrical connections. Instead, a branch with a hose valve should be provided at each set of switches as shown in the diagrammatic layout, Fig. 1, and in detail in Fig. 4, and the tanks filled from a hose. The oil return, however, may be piped up completely, as these connections are at the bottom of the tanks, where there are no electrical connections.

There should be ample adjustment in these pipes so that they will readily swing in any direction, as the switches are usually lined in multiple to suit the electrical requirements and the pipe connections made afterward. With "stiff" connections it is especially difficult to make connections when re-installing the apparatus, and the arrangement shown in Fig. 4 will be found to overcome the difficulty. The arrangement of hose valves which connect the supply and return header and fill the tanks through the latter, as shown in Fig. 3, may be applied here if desired.

Storage Tank

If possible, the oil storage tank should be so located that the transformer may be emptied into it by gravity and the tank filled from barrels without the use of the pump. Where this cannot be accomplished a pump must be used, and if connections are provided as shown in Fig. 1 a pump can readily be employed. The tank should hold from one and one-third to one and one-half times the amount of oil contained in one transformer in addition to the quantity of oil to be stored for the switches. A filling pipe, an air vent into the top and provision for a suction outlet at the bottom are the only connections required. The tank should be fitted with gage glasses and a manhole.

When the tank cannot be located in the power house or near the pump the air-vent cock and gage glasses should be brought to a point where they will be in view of the operator of the oil pump. Fig. 5 shows a typical layout. In this case calibration marks were made on the wall adjacent to the gage glass for every ten barrels of oil dumped so that it would be an easy matter to gage the amount of oil stored in the tank.

Single-Phase Alternator as a Synchronous Motor

Can a 75-kw, 2200-volt, single-phase alternator be operated as a synchronous motor? What equipment is required to start the machine from rest and place it in service? W. O. R.

After being brought to full speed and connected in parallel with the supply system, the single-phase machine will give excellent service as a synchronous motor. However, it is not self-starting. The most satisfactory starting equipment will include a special self-starting single-phase motor for bringing the main machine to full speed.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Magnetic Hysteresis.—FRITZ HOLM.—An account of an extended series of experiments on the validity of Steinmetz's hysteresis laws. While his law that the hysteresis loss is proportional to the 1.6th power of the maximum induction was found to represent the fact very satisfactorily, yet the other law of Steinmetz—namely, that the hysteresis loss depends only on the difference between the limiting values of the magnetic induction and not on their absolute values—was not found to be exact. The author describes an extended series of experiments made with direct current and the ballistic method, and also gives results of experiments made with alternating current which confirmed his former results. The chief result of his experiments is the proof that hysteresis loss during cyclic processes with the same difference between the limits of magnetic induction may be very different if the absolute values of the inductions are different. An application is made to the magnetic process in the rotor of an alternating-current series motor.—*Thesis for degree of doctor of engineering at the Institute of Technology,* Berlin, 1912.

Armature Construction.—R. LIVINGSTONE.—The first part of a paper illustrated by diagrams on some mechanical points in armature construction. In the present instalment the author deals with press fits, armature hubs and end plates for lamination.—London *Electrician,* Jan. 24, 1913.

Steam Turbo-Generators.—H. G. REIST.—An illustrated article dealing briefly with recent tendencies in the design of high-speed alternators. The present approximate limits of output for 25-cycle and 60-cycle designs are specified, although these may change as other methods of construction are adopted. The review touches on the following points: effect of high internal reactance on the ability of the machine to withstand short-circuit strains; methods of supporting and insulating armature coils; rotor designs for providing maximum copper space; rotor coil construction, insulation and support; punchings or forgings for revolving structure; critical speed; successful schemes for ventilation.—*Gen. Elec. Review,* February, 1913.

Lamps and Lighting

Reduction of Cost of Electric Lighting in Germany.—A diagram showing the reduction of the cost of electric lighting of an average four-room residence in Berlin during the period from 1890 to 1912. The reduction is due to two different causes. The first is the reduction of the rate charged by the Berlin Electricity Works, which was 15 cents per kw-hr. from 1890 to 1898, 13.75 cents from 1899 to 1903, and 10 cents from 1904 to 1912. The second cause is the improvement in lamps. The cost for the yearly lighting in a four-room residence is as follows: With carbon lamps, from 1890 to 1898, $55, and from 1899 to 1901, $50; with Nernst lamps, from 1902 to 1903, $25, and from 1904 to 1906, $17.50; with metallic-filament lamps, from 1907 to 1911, $12.50, and with the new ductile tungsten lamp in 1912, $10.—From *A. E. G. Zeitung,* in London *Electrician,* Jan. 24, 1913.

The Rating of Incandescent Lamps.—A. J. MAKOWER.—From numerous tests of lamps of various makes on the market in Great Britain the author concludes that the most usual specific power consumption of metallic-filament lamps at present on the market lies between 1.4 watts and 1.6 watts per horizontal cp (British), and that it is not infrequent to find lamps giving even higher figures than these. "The rating of lamp filaments has evidently greatly changed since their introduction, and although a reference to the makers' catalogs would lead one to expect the power consumption of these lamps to lie between 1 watt and 1.25 watts per cp, it is a comparatively rare occurrence to find lamps that give even so good a consumption as the higher of these figures." While a longer life and a better color of the light may justify this change, the author thinks that the figures for efficiency still appearing in catalogs of manufacturers should be changed. The introduction of metallic-filament lamps has apparently had a most demoralizing effect on the grading of carbon-filament lamps, and the variations that are found in batches of lamps of this type will be surprising to anyone who has not carried out systematic tests. The author recommends drawing up some standard specifications by an authoritative body, like the British standards committee.—London *Electrician,* Jan. 17, 1913.

Rating of Carbon Lamps.—T. MATHER.—The author confirms the very unsatisfactory state of affairs regarding lamp rating, more especially as regards carbon lamps, as sketched by Makower (see preceding abstract). Some results of tests made by the author are given, and it is concluded that "the lamps were obtained from dealers of repute, and the fact that only one batch out of six was reasonably satisfactory shows that the fault lies with the manufacturers by whom the lamps are marked. There is little doubt that the public are being defrauded by the incorrect description of lamps, and in the interests of the industry as a whole steps should be taken to prevent its continuance."—London *Electrician,* Jan. 24, 1913.

Lighting of Churches.—An article by J. N. La Balle on the use of indirect lighting in churches, and an article by R. V. Ely on illumination of the church chancel.—*Lighting Journal,* January, 1913.

Generation, Transmission and Distribution

Steam Turbines.—ERNST BLAU.—A discussion of the use of steam turbines in mines for driving generators and for various other special purposes.—*Elek. und Masch.* (Vienna), Jan. 26, 1913.

Driving Planers and Slotters.—CHARLES FAIR.—An article on the application of direct-connected reversing motors to planers, slotters, key-seaters, lathes, wire-drawing and tube-drawing machines, boring mills and other classes of reversing drive now commonly operated through belts or clutches. The author shows the increase in production and the saving in power which can be achieved with this form of drive and discusses the best methods of operation.—*Gen. Elec. Review,* February, 1913.

Electric Power in Tin Mines.—H. THIEME.—The first part of an illustrated description of the hydroelectric plant of the tin mines at Tekkah, in the Malayan States. The power plant contains two turbines driving 500-hp, three-phase generators. The voltage is 400, and for transmission it is raised to 9000; at the substation it is again reduced to 440. There are two 120-hp induction motors driving the compressor for supplying compressed air for the air-lift system and the centrifugal pump. The article is to be concluded.—*Elek. Zeit.,* Jan. 23 1913.

Transformation from Three-Phase to Single-Phase.—W. W. LEWIS.—No scheme of connections can effect an exact

transformation from balanced polyphase power to single-phase; but some schemes are better than others in the approximation, while some which have been seriously proposed are utterly impracticable. The author analyzes and compares some of those which have been lately proposed, and the results of his discussion are applicable especially to the electric welding industry, in which excessively heavy single-phase loads are often placed on the system and in which therefore a close approximation to even distribution is essential to safe operation of the three-phase system. From the discussion of ten different methods, it is concluded that only one has sufficient merit to warrant its use. This is the simple connection of the transformer across one phase, the generator being connected either in star or delta.—*Gen. Elec. Review,* February, 1913.

Installations, Systems and Appliances

Large Lighting Battery.—F. H. Whysall.—A paper read before the (British) Institution of Electrical Engineering on the results obtained over two complete years' working of the 12,000 amp-hr. battery installed at the Manchester Corporation Electricity Works, Dickinson Street, in March, 1910. The battery consists of 210 cells, each cell containing thirty-eight positive plates and thirty-nine negative plates. The different methods of battery regulation are illustrated in Fig. 1, with special reference to the question of the use of regulating cells (Diagram B) rather than booster regulators. The chief duty of the Dickinson Street battery is to take 3000 kw off the lighting peak. It is also

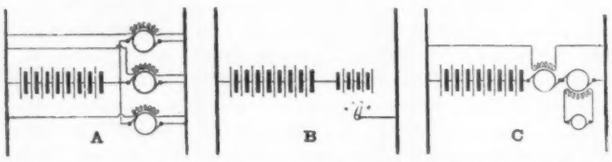


FIG. 1—DIAGRAM SHOWING ALTERNATIVE METHODS PROPOSED FOR BATTERY REGULATION

looked upon as a standby. But its chief duty is load leveling, and it was therefore decided to have three hand-regulated reversible boosters, as shown in Diagram A, and to run them in parallel at times of maximum discharge. At other times one or two would be used as required. At Dickinson Street the battery was also arranged for use on the traction supply, and for this duty a series-parallel arrangement was made of an extra busbar and change-over switches for one booster. The boosters worked quite satisfactorily on the traction load with automatic exciter regula-

TABLE SHOWING SAVING ON WORKS COSTS FOR ONE YEAR

Year	Output to Feeders	Coal Used, Tons	Average Price of Coal	Including Coal Cost, 1910 and 1911	Total Cost per Unit Output to Feeders, Cent	Saving in 1910-11 Against 1909	Total Saving Effected by Battery with Coal at $2.72	Commercial Efficiency, per Cent
1909—no battery.....	25,818,992	40,681	$2.72	...	0.736	.....	.....	...
1910 — with battery.....	29,042,985	39,418	2.75	$820.	0.710	$38,100	$38,920	70.6

tion, as shown in Diagram C, but the saving effected in works costs was not so great as when the battery was used on the lighting load alone. The improvement due to the use of a battery in a steam plant is wholly from the improvement of the load-factor. The author discusses the following items in detail: Saving in standby boilers required equivalent to one-hour rating of battery, owing to extra time available to raise steam and owing to possibility of applying load gradually; saving in capital expenditure and corresponding annual charges thereon; saving in wages of running staff; saving in cost of peak-load units; saving due to "buffering"—that is, load leveling—enabling all units to run at their most economical load. The results obtained in actual practice show a saving on works cost which is given in the accompanying table. The author concludes that, provided the battery is installed to reduce generating plant, it is a sound commercial proposition when considered in connection with a large lighting load. Peak-load units are costly to generate, and allowance is made for this in fixing the charges for lighting. Daylight units are much lower in price because the cost of generation is much less, thus in effect the battery is charged at daylight costs and discharged at lighting rates. If some of the larger consumers on public supply mains only realized this, they would install batteries of their own, buy energy at motor-service rates and cheapen their own lighting service by arranging with the supply authorities for a "restricted-hour" supply; that is, they would take no energy from the mains at peak-load time. Batteries hitherto have usually been installed by consumers only for the sake of making the service reliable and independent of accidents outside their own premises. It does not matter how short a period of time during the day, or the year for that matter, a supply is demanded, equipment must be installed to meet it, and it has been found that for all duty of less than 8 per cent daily load-factor—that is, of less than two hours' demand during the twenty-four hours of the day—the matter is in no doubt. It most certainly pays to make storage-battery provision for this. Beyond this point one must look to advantages other than direct saving in capital cost and running charges to justify the extension of the principle.—London *Electrician,* Jan. 24, 1913.

Artificial Insulating Materials.—H. Passavant.—A paper read before the Berlin Electrical Society on the purpose and the applications of artificial insulating materials in the construction of electrical apparatus. The author discusses especially the systematic complete protection of apparatus by insulation in comparison with apparatus with metallic frames. He discusses the most important requirements of artificial insulating materials and gives the results of tests which show that the artificial insulating materials now available on the market already satisfy severe requirements, especially if in the design of the apparatus the special features of the insulator are properly taken into consideration. A number of designs of the Berlin Electricity Works are described and special attention is called to the use of artificial insulating materials in the construction of electric-heating apparatus. In the manufacture of artificial insulating materials it is important to insure perfect uniformity of manufacture and non-aging qualities during life. Regulator tests should be made to insure that the electrical constants of the materials have not changed.—*Elek. Zeit.,* Jan. 23, 1913.

Tirrill Regulator.—A note on a British patent (No. 627, 1912) of the British Thomson-Houston Company and A. P. Young. In order to keep the generator pressure at a safe value in the event of abnormal pressure rise or fall on the system, an electromagnet is connected across the supply mains. This magnet controls an armature carrying a contact connected to an excited busbar against controlling springs, so that normally it is free of an upper and lower fixed contact connected to one end of the winding of the magnet and to the second excited busbar respectively. The armature of the magnet is carried by a pivoted lever retaining catch for a spring-controlled switch, which is released by excessive pressure variations. It prevents further action of the automatic regulator by breaking the relay circuits and makes connection with intermediate portions of the generator-field resistors.—London *Elec. Eng'ing,* Jan. 23, 1913.

Aluminum Arresters.—R. T. Wagner.—A second article on the construction, installation and maintenance of aluminum arresters and their auxiliaries. In the present instal-

ment the author takes up the question of the location of arresters for indoor and outdoor use, and deals in a practical way with installing, wiring and connecting up.—*Gen. Elec. Review,* February, 1913.

Wires, Wiring and Conduits

Protection of Transmission Lines.—E. PFIFFNER.—An article on the theory and practice of protecting transmission lines. The author concludes that overhead lines should be earthed through non-inductive resistance in order to carry off any static charges. In general there is no danger to overhead transmission lines from the amplitude of voltage rises so that in general no protection against them need be provided; on the other hand, as a protection against dangerous voltage drops condensers should be provided. For cable networks and machines and apparatus in which large magnetic energies are set free on disconnecting or sudden changes of load, properly designed dischargers with a sufficiently small discharge resistance are recommended.—*Elek. und Masch.* (Vienna), Jan. 26, 1913.

Capacity of Double Three-Phase Lines.—C. FELDMAN AND A. C. LOOS.—In high-tension systems it sometimes happens that two lines have to be placed at a near distance from each other. The calculation of the mutual inductance and self-inductance is well known. The calculation of the increase in capacity due to the presence of the second line is more difficult. The author gives simple formulas for the calculation of the capacity of such lines, making use of certain mean geometrical distances. Similar mathematical methods may be used for the calculation of the inductance of such lines.—*Elek. Zeit.,* Jan. 23, 1913.

Electrophysics and Magnetism

Calculating the Combined Resistance of Shunt Coils.—H. W. BROWN.—A description of a new device for calculating the combined resistance of two or more shunt circuits as shown in Fig. 2. The mode of operation is as follows: Take as an example two circuits, one of 75 watts and the other of 25 watts. The thread hanging from *A* would be stretched across to 75 on the right-hand side of the scale, and that from *B* to 25 on the left-hand side. Where these two threads cross, the combined resistance of the two circuits can be read off by means of the horizontal lines. It will be seen that the range of the device can be extended and that the percentage of current in each circuit can be

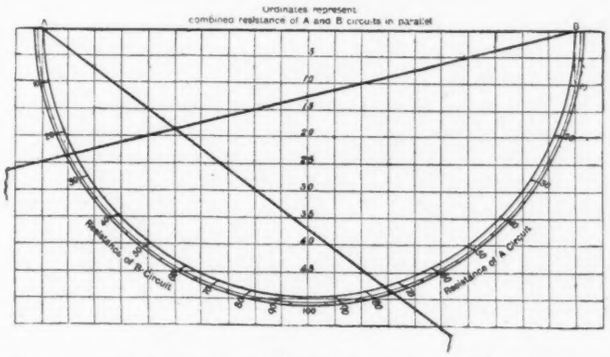


FIG. 2—DEVICE FOR CALCULATING JOINT RESISTANCE OF PARALLEL CIRCUITS

read off by means of the vertical lines. It is easy to see how the device is constructed.—London *Elec. Review,* Jan. 24, 1913.

Electrochemistry and Batteries

Electric Steel Furnace.—C. H. VOM BAUR.—An illustrated article on the first combination induction furnace in operation in the United States. One of the diagrams given illustrates the increase of the efficiency with decrease of the time necessary to bring the heat to the melting point.—*Met. and Chem. Eng.,* February, 1913.

Units, Measurements and Instruments

Recording Instruments.—A. PALLM.—An illustrated description of new recording instruments made by Hartmann and Braun. The chief feature is that the record is obtained in rectangular co-ordinates while a rotary system of measuring instruments is used. Fig. 3 shows the arrangement: *A* is the vertical axle of the rotating coil *S*. Co-axial with *A* is the segment *C* of a cylinder which is embraced on one side by the handle *H*. The recording strip *R* is drawn by

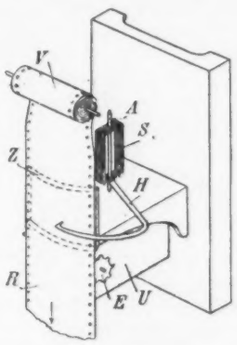


FIG. 3—DIAGRAM OF RECORDING INSTRUMENT

means of the clockwork *U* from the supply roll *V* over the cylinder surface so that it is curved and the point at the end of the handle records directly on the record strip, the lengths recorded being in constant proportion to the angle of deflection of the coil. This arrangement permits a very satisfactory utilization of the interior space of the recording instruments so that it possible to place various measuring instruments from a voltmeter up to a triple wattmeter into one and the same frame of moderate dimensions. The construction of the clockwork, the recording mechanism and the combination of this recorder with various types of measuring instruments are described.—*Elek. Zeit.,* Jan. 23, 1913.

Measuring the Inflammability of Coaldust.—An account of the second report of the mine explosions committee to the British Home Secretary on experiments made to determine the inflammability of various coaldusts. The method of investigating chiefly followed by the committee de-

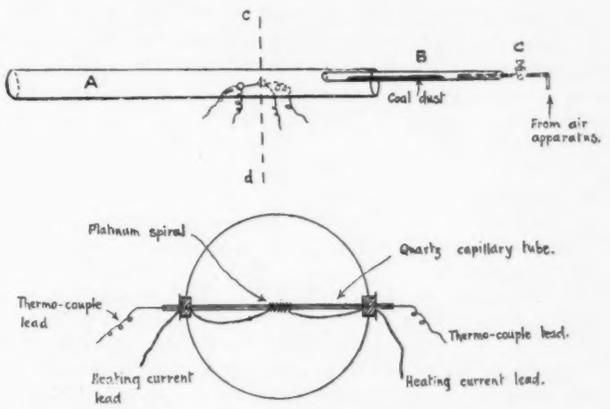


FIG. 4—INSTRUMENT FOR TESTING COALDUST

pends upon the destructive distillation of different varieties of coal under different conditions. Accurately weighed quantities of the dust are blown upon a platinum spiral maintained at the same temperature in each case, and their relative inflammabilities are judged by the impulses given to a ballistic pendulum by the sudden expansion consequent on the inflammation of the dust clouds. In Fig. 4 *A* is a glass cylinder, open at both ends. A platinum coil closely wound onto a tube of thin-walled quartz of capillary bore passes horizontally across a diameter of the cylinder.

Through the bore of the quartz tube a platinum and platinum-rhodium thermocouple passes. By means of suitable connections an electric current can be passed through the spiral, so that it can be heated to any temperature up to about 1400 deg. C. and maintained at a constant temperature by the adjustment of an external resistance. The coaldust to be tested is blown across the heated spiral as a cloud of fairly uniform density, successive trials being made until a temperature is found at which general inflammation of the dust cloud takes place. The French mining authorities have carried out experiments dealing with the same problem, and their index of inflammability is the size or length of the flame produced when a given quantity of the dust is blown through a vertical porcelain tube of 25 mm internal diameter and 10 cm long, heated to a temperature of 900 deg. C. The Home Office committee has made similar experiments, using an electric furnace and photographing the flame. The experimenters found that, provided all the experimental conditions were maintained rigidly constant, the size and type of flame obtained from one particular coal remained remarkably constant from one experiment to another. Comparison between one coal and another by means of the photographs of their flames can, therefore, be relied on.—London *Elec. Review,* Jan. 24, 1913.

Telegraphy, Telephony and Signals

National Telephone Arbitration.—The lengthy arbitration between the National Telephone Company and the British Post Office has been brought to a close by a judgment awarding the company the sum of $62,576,320 for the whole of its undertaking. The company had claimed $100,000,000. The British government has thus acquired "a most valuable system at a price which, though just, is certainly moderate." It is thought that many of the points covered in the judgment should have an important bearing on future arbitrations of this character as they set certain precedents.—London *Electrician* and London *Elec. Review,* Jan. 17, 1913.

Condenser Shunted to Telephone in Wireless Telegraphy.—In practically all systems of wireless telegraphy the telephone receiver has superseded all other forms of reception, and the best results are obtained when the telephone is shunted with a capacity. The author investigates in detail the function of this capacity. His chief results are that the value of the capacity used as a shunt to the telephone which produces the maximum intensity in the telephone is not independent of the break in the primary current at the sending station; that in the general case where circuits in parallel with the telephone have a large resistance this maximum is due to resonance in the telephone circuit alone, and that the "harmonics" in the break, and not the frequency of the break itself, may be the most important factor in determining the value of the capacity to produce the best effect for any one telephone.—London *Electrician,* Jan. 17, 1913.

Junction Boxes.—A. Ebeling and R. Deibel.—A translation of their German paper recently abstracted in the *Digest* on junction boxes or the like, with constant insulation of high value, for installations operating at low voltage. The authors show that the insulation materials hitherto used are not very well suited to low-tension connecting apparatus, and a new principle is disclosed, namely, connection above the surface of oil, which is independent of all conditions of the weather and by which permanently good insulation values may be guaranteed. The application of the new principle is explained by referring to illustrations of several types of apparatus that have given excellent results.—London *Electrician,* Jan. 24, 1913.

Receiving Antennas.—E. Leimer.—A description of various arrangements and devices which can be used as antennas for the reception of Hertzian waves, with special reference to convenience and simplicity of arrangements. —*Elek. Zeit.,* Jan. 23, 1913.

Book Reviews

Electric Lighting and Miscellaneous Applications of Electricity. A Textbook for Schools and Colleges. By William Suddards Franklin. New York: The Macmillan Company. 300 pages. Price, $2.50.

An elementary textbook of electrical engineering for schools. The subjects covered are numerous and have, therefore, to be treated briefly and without great detail. The chapters relate to the following subjects: Installation and operation costs; electric distribution and wiring; alternating-current lines; photometry; electric lamps, shades and reflectors; interior illumination; street illumination; electrolysis and batteries; telegraph and telephone; dielectric stresses; problems. Like all of Dr. Franklin's writings the book is characterized by directness and originality of style. It is illustrated with simple and clear diagrams. The mathematical treatment is largely arithmetical, rather than algebraical. The volume will recommend itself to high schools and colleges in which a general outline of electric lighting is taught.

The Metric System in All Its Branches. By Henry G. Bayer. Published by the author at 232 Greenwich Street, New York. 94 pages, 13 illus.

A little book, probably the most comprehensive of its kind, that presents in a concise form a vast number of accurate data of value to all persons engaged in any scientific, commercial or educational work that necessitates the conversion of foreign measures into the United States equivalents or vice versa. There is a short introduction reviewing the history of the metric system, telling some of its advantages and giving a list of the countries which have adopted it as a standard. This is followed by five chapters in which the system is clearly defined, its etymology is recounted and the metric units of length, surface, volume, capacity and weight with their multiples are explained. Each chapter contains numerous conversion tables, many of which are extended to include the metric equivalents for decimal and fractional parts of the United States units. In addition to the foregoing are three useful chapters containing a description of miscellaneous units, such as tables of foreign money and the United States equivalents and the units of work, force and heat. The various thermometer scales are also described and complete formulas for converting the reading on one scale to its equivalent on any of the others are a part of the book.

The Theory of Engineering Drawing. By Alphonse A. Adler. New York: D. Van Nostrand Company. 289 pages, 273 illus. Price, $2.

Descriptive geometry, the subject matter of the book at hand, has been presented in numerous textbooks in ways very similar. It is, therefore, of interest to note a departure from the trodden path, and particularly so as the author seems to have succeeded in presenting the subject in a clear and logical way. The usual practice is to start with a set of definitions, to consider in detail the orthographic projection of a point, and then, on the foundation thus laid, to build the theory of the projection of lines, surfaces and solids. In this volume the order of presentation is reversed, and the reader is asked to consider first some concrete object—a box, for instance—the study of which furnishes material of use in the later discussion of its bounding surfaces and lines. The book is divided into four parts. Part I treats of oblique and orthographic projections, Part II contains a variety of problems on the subjects treated in Part I, Part III considers perspective projection, and Part IV the pictorial effects of illumination in projection drawings. The treatise is prepared in such a way as to make the subject easily understood by the beginner. It will also serve as a handy reference book.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Electric Hair Drier

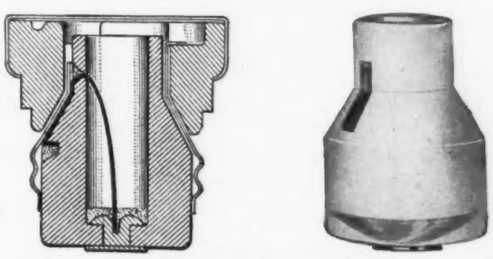
An electric hair drier of simple design is being placed upon the market by The Sanax Company, Inc., of New York City. The heating unit is located in the barrel of the blower and is so arranged that it may be taken out and replaced in a very short time. The heater is instantaneous in operation and a strong blast of either hot or cold air may be had immediately after connecting the blower into the circuit. Switching arrangements are provided for controlling the temperature of the outflowing air.

ELECTRIC HAIR DRIER

Aluminum has been used wherever possible in the construction of this device. The weight of the apparatus is about 2 lb. It is stated that no special wiring installation is necessary as the blower may be connected to any ordinary wall socket or lighting fixture. The cost of operation is said to be approximately 2 cents an hour.

Fuse Plugs with Renewable Core

Ordinarily when a fuse blows the whole fuse plug has to be thrown away. A considerable improvement is accomplished in a fuse plug designed and manufactured by the H. T. Paiste Company, Philadelphia. It is made in two



FIGS. 1 AND 2—SECTIONAL VIEW OF FUSE PLUG AND THE RENEWABLE CORE

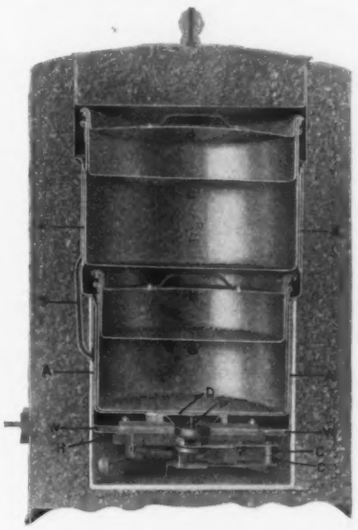
parts, a permanent mica cap holder with brass screw shell and a removable porcelain core containing the fuse. When the fuse blows the core is taken out and a new one slipped into the holder. In the core one end of the fuse strip is soldered to the bottom contact rivet; it is then carried up through the hollow center of the porcelain, out through the side, then bent over, and the outside end is cemented fast.

When the core is slipped into the holder and screwed into a cut-out the outside part of the fuse strip is forced tight against the brass sleeve of the holder and completes the circuit. The plugs are made in standard sizes for all emfs up to 125 volts.

Automatic Electric Cooker

A photographic section of an automatic electric cooker which is being manufactured by the Berkeley Electric Cooker Company of Berkeley, Cal., is shown herewith. All of the cooking vessels illustrated in close contact with the walls are made of aluminum. The heat conducting and distributing medium used between the electrical heating elements and the food receptacles is live steam.

Referring to the illustration, the double-walled hermetically sealed steam chamber is marked *A-A-A*. In the bottom of this chamber the small quantity of water shown at *W-W* is boiled and partially changed to steam by the heat from the heating unit *H*. When the steam pressure in the sealed chamber is sufficient to overcome the spring in the diaphragm *D*, which is constructed like the bottom of the oil can, it snaps downward, acting upon the pin *P*. The movement of this pin opens the switch contacts *C* and interrupts the energy supply. A subsequent reduction of



AUTOMATIC ELECTRIC COOKER

pressure allows the diaphragm to return to its original position, and this action again closes the switch contacts and continues the heating.

An interesting feature in connection with the cooker is the timing attachment by means of which the heating unit may be switched automatically into the circuit at any predetermined hour. This is accomplished through an alarm clock arranged in the electric heater circuit.

It has been stated that the cost of cooking the food depends upon its quantity and specific heat. For instance, 10 lb. of food material, including a roast, two or three kinds of vegetables and a pudding, may be cooked four hours, if the roast require it, with an expenditure of 600 watt-hr. to 700 watt-hr., or at a cost of from 6 to 7 cents, if the rate is 10 cents per kw-hr. At a 7-cent rate the cost would be from 4 cents to 5 cents.

The cooker completed stands 24 in. high and its shipping weight is 54 lb. The heating unit has been designed to consume 550 watts and may be connected at an ordinary lamp socket.

Floor Outlet Boxes

One of the important advantages of the so-called Acme floor outlet box is the vertical and horizontal adjustments, of which the latter may be effected after the finished floor is laid.

The boxes are all hot-dipped galvanized, each equipped with a rabbeted frame, permitting the removal of the cover without disturbing the floor. They are adapted for all standard makes of flush receptacles. They are thoroughly machined, and all the parts of the device are interchangeable.

This floor box is manufactured by the H. Krantz Manufacturing Company for John Fountain, Inc., 160 Seventh Street, Brooklyn.

Electric Welding by "First Intention"

Electric welding by "first intention" is accomplished with the portable electric welders manufactured by the Indianapolis Switch & Frog Company of Springfield, Ohio. The single electrodes used on these welders are made of special steel and furnish both the high-temperature arc required for welding and the fluxing steel.

In order to obtain a satisfactory weld, the bodies to be welded together must both be in a semi-molten condition, and the heavier piece must not conduct away the heat so fast that the metal brought in contact with it is chilled before the two pieces have a chance to weld. The manufacturer has found that a satisfactory weld is obtained only when the piece to be welded is the cathode. This peculiarity may be explained by the fact that the cathode of an electric arc is always the hotter, thus getting around the difficulty mentioned above.

The material of which the electrode is made is also responsible for the succcessful action of the electric welder. An alloy of specially treated machine steel, tool steel and Norway iron in definite proportions makes up the composition of the electrode. The special treatment of the electrode probably prevents the iron being converted into iron oxide by the intense heat of the arc.

The apparatus used with this welder is very simple, consisting of a conductor (fastened to a pole to be hooked over trolley wire), a ventilated set of resistance grids, a circuit-breaker, an electrode holder and switches for cutting out resistance. The arc used in connection with most of these outfits operates at 36 volts and about 170 amp.

PORTABLE ELECTRIC WELDER

On the authority of the manufacturer of the electric welder here described the figures which appear in the table in the other column are given as the comparative periods required for welding with the electric and acetylene machines.

Taking the case of filling one elongated hole, the following data were supplied by the company. An acetylene welding company is reported to have said that for labor, material and gas it would cost about 63 cents per hole. In comparison, assuming labor at 40 cents an hour and power at 0.5 cent a kw-hr., the following approximation was arrived at by the Indianapolis Switch & Frog Company for electric welding: Two sticks of special steel, 14 cents; power, 4 cents; labor, 8 cents; overhead charges, 10 cents; total, 36 cents per hole. The time saved and the simplicity of operations make the electric welder worthy of consideration.

COMPARATIVE DATA ON ELECTRIC AND ACETYLENE WELDING

	Electric	Acetylene
Tapered keyway and thread (on G. E.-1000 armature shaft)	45 min.	3¼-4 hrs.
⅜-in.x8-in. weld on worn-down armature shaft (same as above)	1½ hrs.	6 hrs.
Filling three holes 1 in. in diameter by 1.125 in. deep.	15 min.	1 hr.

Exhibit of Historical and Modern Telephone Apparatus

A permanent exhibit of historical and modern apparatus has been arranged by the Western Electric Company in conjunction with the American Telephone & Telegraph Company. The historical section shows the development of the telephone from its earliest stages up to the present time, and includes the smoked-glass records of sound waves made by Alexander Graham Bell in 1874, parts of Bell's original telephone of 1876, and a number of instruments showing the gradual improvement of the apparatus. This section also includes the switchboard used by Mr. Bell in opening the New York-Chicago line in 1892 and the receivers and transmitters which were used on the occasion of the opening of the long-distance telephone line between New York and Denver in 1911.

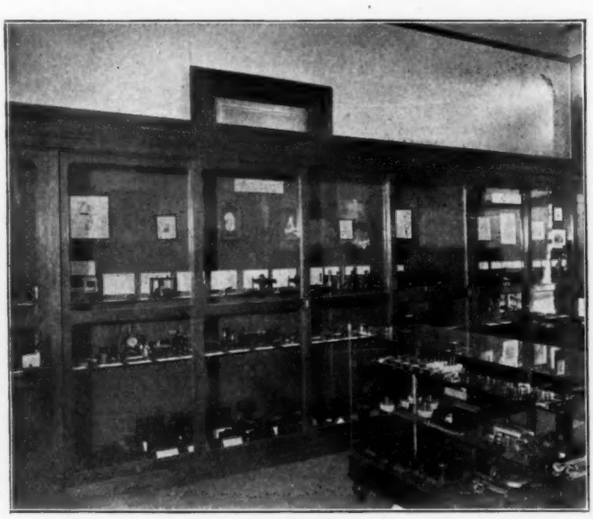


FIG. 1—EXHIBIT OF HISTORICAL TELEPHONE APPARATUS

The modern-apparatus section contains switchboards with connections to a number of telephone sets, so that service demonstrations may be made to visitors; intercommunicating systems, and telephone train-dispatching apparatus in operative condition. Miscellaneous telephone apparatus, such as combined jacks, cords, plugs and repeating coils, as well as samples of telegraph apparatus, are exhibited in a

large showcase. In other showcases are samples of the various supplies manufactured by the Western Electric Company, including electric household goods of all kinds, such as vacuum cleaners, sewing-machine motors, heating devices, bells, lamps, sockets and switches, insulators and insulating material.

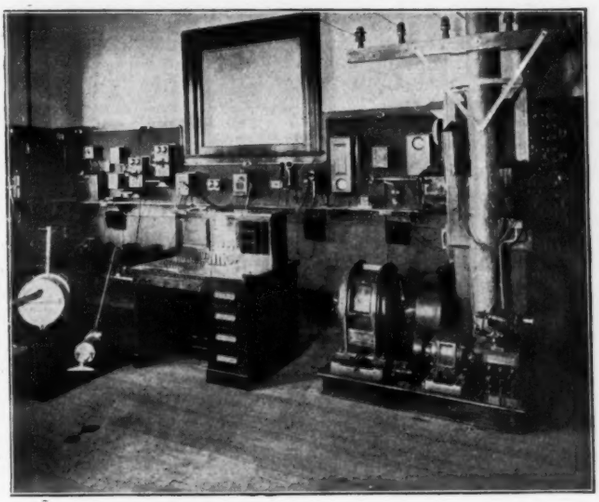


FIG. 2—EXHIBIT OF TELEPHONE APPARATUS AND APPLIANCES

This interesting exhibit of telephone and other electrical apparatus is displayed at the Western Electric Company's offices, 463 West Street, New York City.

Underfeed Stokers

The stoker illustrated herewith is somewhat different from other types of underfeed stokers, the moving grates extending across the entire width of the furnace at an incline of about 20 per cent. The grates have a continual reciprocating motion in opposite directions for adjacent retorts, which forms a shearing line between each pair, preventing the formation of clinkers above the air openings. In some types of stokers which use dead plates or stationary tuyères for supporting the fuel the clinkers prevent free flow of gases, which causes a reflex action, tending to melt the iron. The shear between the moving retort side and the side wall of the furnace keeps the brickwork free. The crusher action of the pusher noses at the bottom of the overfeed grates is effective in preventing the accumulation of clinkers of large size at this point.

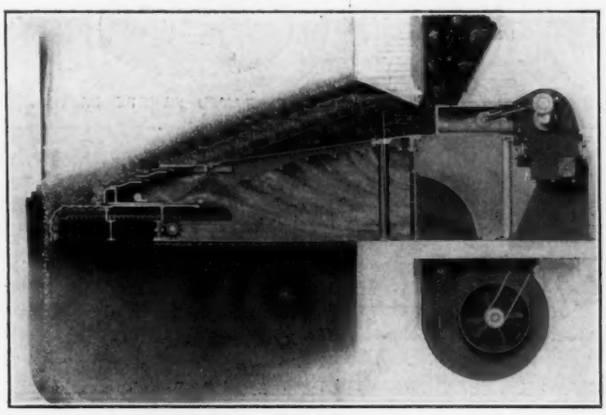


FIG. 1—SECTION OF UNDERFEED STOKER

There is only one plunger for each retort, making the construction and operation very simple. An obstruction caught in front of a plunger will block that plunger only and it cannot do other damage than the shearing of a pin which forms the safety device and which can easily be replaced.

The simple driving mechanism of this stoker is entirely visible from the outside and easily accessible, and the air space underneath the stoker may be reached through the door or through the opening in the front air plate on the side door. The moving retort sections are large and massive and are readily accessible. Whole sections may be disconnected at will from the driving mechanism, and removed or replaced without further disturbing any other part or section. All parts are interchangeable.

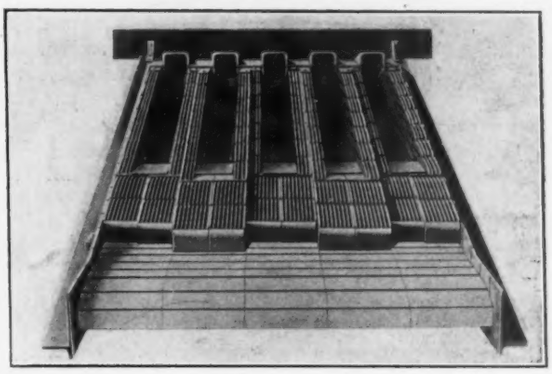
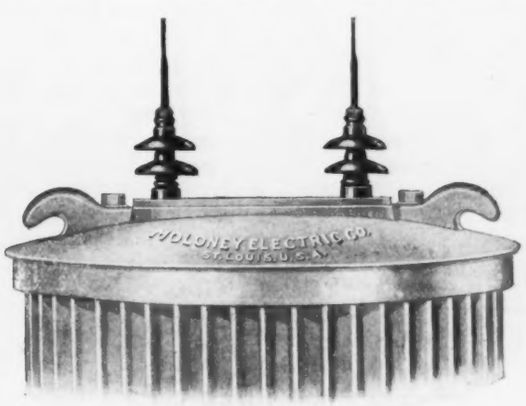


FIG. 2—FRONT VIEW OF STOKER

Among other features may be mentioned the small amount of head-room required, which permits ample combustion space, and the complete separation of ash pit and fireroom, which prevents obnoxious gases and dust from entering the fireroom. This stoker is manufactured by the Sanford Riley Stoker Company, Ltd., Worcester, Mass.

Outdoor Transformers

In the accompanying illustration is shown the type of bushings used on outdoor transformers built by the Moloney Electric Company, St. Louis, Mo. The insulators are designed to secure continuous operation under severe weather conditions, such as during rain, sleet and snow.



TRANSFORMER FOR OUTDOOR SERVICE

It is stated that transformers equipped with these insulators have been giving perfectly reliable service for the past three years on the Pacific Coast, where the precipitation of moisture is very great in some localities, and in parts of Canada where extreme weather conditions are encountered. These transformers are built for all commercial voltages up to 44,000 in both single-phase and three-phase units.

Electrical Features of Commercial-Vehicle Automobile Show in Chicago

Among the exhibitors of electric vehicles at the second, or commercial-vehicle, week of the National Automobile Show in Chicago, on Feb. 10-15, were the following: Baker Motor Vehicle Company, Cleveland, Ohio; Buffalo Electric Vehicle Company, Buffalo, N. Y.; General Motors Truck Company, Pontiac, Mich.; General Vehicle Company, Long Island City, N. Y.; Kentucky Wagon Manufacturing Company, Louisville, Ky.; Studebaker Corporation, Detroit, Mich.; The Lansden Company, Newark, N. J.; Walker Electric Vehicle Company, Chicago, Ill.; Waverley Electric Company, Indianapolis, Ind.

A few features of special interest may be enumerated.

To relieve the driving axle of the weight of the motor, the Buffalo Electric Vehicle Company suspends its motor about midway between the front and rear axles in a special support. This support allows longitudinal motion of the motor as well as side thrust. The motor is connected to the differential gear without the use of universal joints.

The General Motors Truck Company exhibited a 3-ton chain-driven truck having the motor fastened rigidily to the frame. A half-spiral, flexible steel shaft connects the motor with the countershaft. This flexible shaft eliminates the sudden jar of starting to a great extent and is said to give a decidedly increased life of tires. A water-proof cable, tested for 2300-volts, connects the motor with the controller, which is under the hood, thus avoiding the chance of a ground on the frame.

Morse silent-chain drive is used between the motor and the countershaft on the General Vehicle Company's trucks.

One of the new features of the Studebaker commercial trucks is their worm-drive. A reduction of eleven to one is secured in a fairly small space. Timken roller bearings are used in this drive.

Battery removal and replacement is hastened in the Lansden truck by having two doors on the battery case, which is from 12 in. to 14 in. above the ground. When a battery is to be recharged the truck is run into the garage and the discharged battery taken out on one side while a newly charged battery is introduced from the opposite side. The service foot brake cuts off the power before applying the brake, at the same time returning the controller handle to the neutral position.

The Walker Electric Vehicle Company has a new partial delivery-type truck. Half of the batteries are under the hood and the other half are on or under the body.

The following electical accessories manufacturers had booths at the show: Atwater-Kent Manufacturing Company, Badger Brass & Manufacturing Company, Briggs Magneto Company, Champion Ignition Company, Edison Storage Battery Company, Electric Storage Battery Company, Gould Storage Battery Company, Gray & Davis, Inc.; Hartford Suspension Company, Heinze Electric Company, Ignition Starter Company, Kokomo Electric Company, Marburg Brothers, Inc.; Motsinger Device Manufacturing Company, National Coil Company, Philadelphia Storage Battery Company, Pittsfield Spark Coil Company, Remy Electric Company, Splitdorf Electric Company, The Esterline Company, United States Light & Heating Company, Vesta Accumulator Company, Warner Manufacturing Company, Westinghouse Electric & Manufacturing Company, Willard Storage Battery Company.

The Atwater-Kent Company has put out a silent timer and distributer with an automatic spark advance.

The rated output of the Edison storage battery has been increased to 450 amp-hr. with a weight of 30 lb.

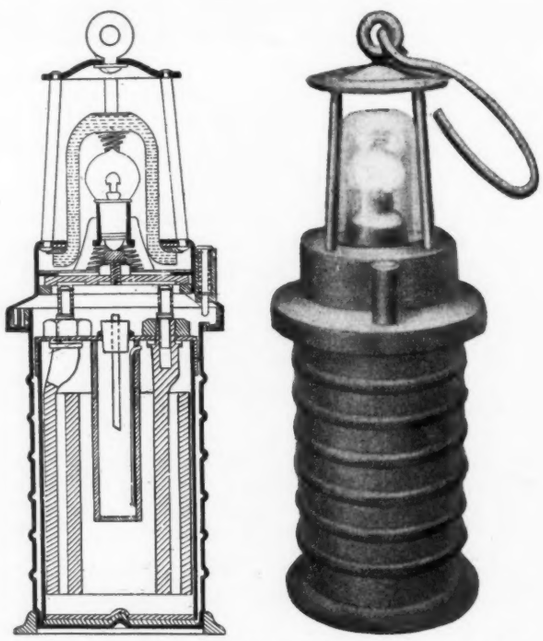
The Hartford Suspension Company, Ignition Starter Company, Remy Electric Company, Esterline Company, United States Lighting & Heating Company and Westinghouse Electric & Manufacturing Company had displays of their electric starters and lighting generators showing the connections made with batteries, switches and lamps.

The Remy Electric Company has a new low-speed lighting and ignition outfit on the market weighing 35 lb. The regulation of the generator is accomplished by means of a third brush set about 30 deg. from one of the other brushes and connected to the shunt-field circuit.

Both the Westinghouse Electric & Manufacturing Company and the Edison Storage Battery Company exhibited vibrating-type rectifiers, working on the principle of a polarized relay, which are less expensive than the mercury-arc rectifiers and more durable.

Miner's Electric Safety Lamp

The British government recently offered a prize of $30,000 for an electric lamp which would meet all of the requirements of mine service in a satisfactory manner. This prize was awarded to Mr. F. Faerber, of Dortmund, Germany, for the lamp shown in accompanying illustrations. The so-called "Ceag" lamp consists of a storage battery inclosed in a corrugated tin casing with a rotating and removable top part, the latter being surmounted by an incandescent lamp inclosed in a heavy glass cover. The storage battery is insulated from the casing with celluloid.



FIGS. 1 AND 2—ELECTRICALLY OPERATED SAFETY LAMP FOR MINERS

The battery electrodes are cylindrical and are placed concentrically. It is said that this scheme prevents warping of the plates. In the center of the battery is placed a metallic cylinder, which serves as a gas chamber and exhaust. The openings allow the escape of gas but retain the electrolyte.

The top part of the lamp is held in place by means of a bayonet joint on the bottom casing and may be locked by a magnetic lock. The light is switched on and off by revolving the top part with regard to the base. The incandescent bulb is protected by a heavy glass dome surrounded by four iron bars and is mounted between spiral springs to reduce film breakage.

The lamp is rated at 1.5 cp, 2 volts, and will operate for a period of sixteen hours on one charge. The total weight of the lamp is 5 lb. It is stated that the cost of operation for one sixteen-hour period is about 2.5 cents. The lamp has been placed on the market in this country by the Mannesmann Light Company of America, 55 John Street, New York.

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Will Transmit Energy to West Virginia Coal Mines.—If present plans are consummated, mining operations at more than 220 coal mines in Kanawha, Raleigh and Fayette Counties, W. Va., from which some 18,000,000 long tons of coal are produced each year, will be conducted before the close of 1913 by electrical energy from the steam generating station which the Virginian Power Company is building at Cabin Creek Junction, on the great Kanawha River, 15 miles southeast of Charleston, W. Va. This station will have an initial equipment of two 10,000-kva Westinghouse-Parsons turbo-generating units. Later on two more units of the same rating will be added. Babcock & Wilcox boilers will be installed. Three-phase, 60-cycle energy will be generated at 6600 volts, and this will be stepped up to 44,000 volts for transmission. The main transmission line from the Cabin Creek station will go to Beckley, a distance of 45½ miles. Steel towers furnished by the American Bridge Company will be used to carry this line. The distribution system, which will be about 115 miles in length, will be supported by steel poles supplied by the Franklin Steel Company. It is possible that a line to Charleston will be built. About 8000 kw of the plant's output has been contracted for to date by the various coal-mining companies. It is expected that the Cabin Creek plant will be in operation by July 1, 1913. In addition to the steam station, the company is contemplating construction of hydroelectric stations at several of the water-power sites which it controls on New River. Of these sites, those of greatest possibilities are at Bluestone Junction, where 125,000 hp is available; at Gauley Bridge, where 35,000 hp can be developed, and at Richmond Falls, about 10 miles above Bluestone Junction, where 15,000 hp is available. The Virginian Power Company was incorporated last fall under Massachusetts laws, as noted in these columns Oct. 5, 1912, with a capitalization of $10,000,000. Its president is P. G. Gossler, of A. B. Leach & Company, New York; its vice-president is George P. Tobey, and its secretary and treasurer is Wilbur Tusch, both of whom are associated with A. B. Leach & Company. Mr. Gossler is also chairman of the board of directors of the Columbia Gas & Electric Company, which operates the public utilities in Cincinnati. The latter city is about 190 miles from the Virginia company's water-power sites.

Toledo Railways & Light Changes.—At the annual meeting of the Toledo Railways & Light Company, held on Feb. 10, following postponement from the regular date, Jan. 16, L. E. Beilstein and R. C. Pugh, of Toledo; W. H. Netherlands, of Louisville, and W. E. Hutton, of Cincinnati, resigned from the board, and P. E. Schilling, W. J. Marshall, W. R. Hodge and H. S. Swift were chosen in their places. The newly elected directors are employees of the company and it is planned to replace them later upon the board with representatives of Henry L. Doherty & Company, who, as previously noted, will operate the reorganized property as the Toledo Traction, Light & Power Company. A meeting is to be held on Feb. 27, at which the permanent members of the board will be chosen and new officers elected. Approval was given at the annual meeting of the action taken by the reorganization committee for reorganizing the company. All of the securities of the underlying companies were taken over by the Toledo Traction, Light & Power Company, with the exception of some $2,300,000 bonds of the gas and coke subsidiaries. The property will be operated under three departments, one taking charge of the street-railway system, one of the lighting business and the third of the electric interurban lines. Approval was given at the meeting of the contract with the Doherty Operating Company for managing the properties.

The Copper Situation.—The January statement of the Copper Producers' Association shows that the surplus of metal is still increasing, owing to the excess of production over deliveries. The surplus has shown a progressive increase since last August from some 46,700,000 lb. to the present quantity of about 123,200,000 lb. Total deliveries in the same period fell from a maximum of 149,200,000 lb. in August to a minimum of 123,700,000 lb. the following month, remaining very near the latter figure for the ensuing four months and touching 125,600,000 lb. in January. Production, except for November, has remained not far from the January figure of 143,500,000 lb. Domestic consumption touched the high mark for the year in October, reaching 84,100,000 lb., falling off, however, in both November and December, but rising again to 65,200,000 lb. in January. The drop from October to December amounted to 30 per cent and accounts for the break in the market which came after the opening of the year. In view of an increase in the domestic deliveries in January the course of the market in the near future is uncertain, but it remains a fact that 16-cent metal allows the producers at least a reasonable profit, and perhaps more, and therefore a higher figure represents simply a needless burden on the consumer.

United States Light & Heating Company's Plant Busy.—An executive of the United States Light & Heating Company was quoted last week as follows: "At present business with us is exceptionally good; in fact, we are unable to handle all the orders on our books. Our plant at Niagara Falls is turning out electric starters at the rate of approximately 1500 a month, and we have orders for thousands of these devices which are to be placed later. Contracts covering many years have been closed with several of the big automobile companies to supply them with our starters and lighters. While this new branch of our business is showing a big gain, our car-lighting business continues good. Total shipments for December were $268,000, and for January they are expected to amount to between $325,000 and $350,000. We intend to increase our monthly output, so that we shall be in a position to meet the constantly increasing demand for our products."

Kentucky Utilities Buys Richmond (Ky.) Company.—The Kentucky Utilities Company, which is controlled by the Middle West Utilities Company, has purchased the Richmond (Ky.) Electric & Power Company. L. B. Herrington, president of the Richmond company, is also president of the Dix River Power Company, which, as stated in these columns April 13, 1912, is planning to build a 20,000-hp hydroelectric station on the Dix River in Boyle County, Ky., near its confluence with the Kentucky River. According to the terms of the recent Richmond sale, the Richmond property is to be operated under Middle West management along with stations in Somerset, Lawrenceburg, Versailles and other Kentucky cities which have been purchased during the past few months and which may ultimately be turned over to the Kentucky Utilities Company.

Thompson Electric Company's Plans.—The Thompson Electric Company, of Cleveland, Ohio, has increased its capitalization from $10,000 to $50,000 to provide funds for the increased business it is doing. The company is to manufacture automatic safety cut-out hangers for arc lamps and large tungsten units and clusters, and will shortly place upon the market a high-voltage series cut-out hanger for street lighting. A. J. Thompson is president of the company and Charles E. Pope, who was formerly mechanical engineer for the National Malleable Castings Company of Cleveland, is secretary and treasurer.

New York Edison's Annual Meeting.—Edgar Palmer, president of the New Jersey Zinc Company, was elected a director of the New York Edison Company, to succeed his father, the late S. S. Palmer, at the annual meeting this week. The other directors were re-elected.

Electric Storage Battery Company's Twenty-fifth Anniversary.—Celebrating its twenty-fifth anniversary and at the same time repeating on a more elaborate scale the hospitality displayed in former years during the Automobile Show, the Electric Storage Battery Company, of Philadelphia, gave a handsomely appointed dinner at the Midday Club in Chicago on Feb. 5. There were about 200 men present, and they included manufacturers of and dealers in electric vehicles, "Exide" distributors and other friends of the company. The word "Exide" was displayed in letters of electric light at one side of the room. It was expected that Mr. Herbert Lloyd, president of the company, would be present, but he was unable to attend, a telegram read during the dinner explaining that the was compelled to remain in Philadelphia because of the death of an intimate friend. Mr. Charles Blizard, vice-president, was present and presided at the dinner, Mr. Godfrey H. Atkin, manager of the Chicago office, serving as his active lieutenant. There was no speechmaking, but after the cigars had been distributed a number of professional entertainers gave an excellent cabaret show. The menu, on gray paper, was margined in silver in honor of the anniversary. It contained some amusing "Exidioms," among them the following: "If you leave the club after 2 a. m., don't waste time in trying to crank your car; remember, it's an electric." "When meeting a car turn to the left. The approaching car will turn in the same direction. You can then determine which is the best-built car." "All the gasoline people to-day are shouting 'self-starters.' The electric vehicle was the first self-starter in the field." The dinner and the fun-making were greatly enjoyed by all who had the privilege of attending.

Injunction Restrains Central Union Telephone Sale.—Minority stockholders of the Central Union Telephone Company, the subsidiary Bell company operating in parts of Illinois, Indiana and Ohio, have obtained a temporary injunction in a state court in Chicago restraining the American Telephone & Telegraph Company and the Chicago Telephone Company from effecting the proposed change whereby the Illinois properties of the Central Union company will be consolidated with the Chicago Telephone Company. The proposed reorganization is a part of the plan of the parent company to have separate subsidiary companies within the boundaries of each state. The petitioners are William A. Read, a New York banker, and his associates, Charles J. Spencer and Charles G. Foster. Together they are said to own 829 shares of Central Union stock having a par value of $82,900. The present par value of the outstanding stock is $5,450,000, of which the American Telephone & Telegraph Company is said to own $5,204,977. The petitioners assert that the proposed reorganization would violate the laws of Illinois relating to stock ownership by corporations; also that the rights of the minority stockholders have been disregarded. B. E. Sunny, president of the Chicago Telephone Company, says that the charges are absurd and that it is a matter of plain business economy to consolidate the properties in each state so as to facilitate reports to the various state commissions now in existence or which may be created hereafter.

Notes from Byllesby Companies.—The Consumers' Power Company has completed the tie line connecting the station at Cannon Falls with the Mankato distributing system. The Appalachian Power Company has completed its lines to serve the Vaugh and Flannagan coal-mining properties. If plans now under consideration for the construction of an interurban railway between Bluefield, Va., and Princeton, Va., a distance of 12 miles, are carried out, the Appalachian company will furnish the energy for operating this road and will also obtain rental for the use of its tracks in Bluefield. There are good prospects in Sioux Falls (S. D.) for the Sioux Falls Light & Power Company to secure additional motor-service load from the stone quarries in the western part of the city. Four new mills, each of which will require about 100 hp for its operation, will be constructed in the next few months in the Arkansas Valley, Col., for handling the alfalfa output and the Arkansas Valley Railway, Light & Power Company is looking for additional load from this source. Business conditions in all of the sections where the public utilities are operated by the Byllesby syndicate are said to be very flourishing and the utility managers are very optimistic, therefore, as to the outlook for new business during the present year.

United Public Service Company's Holdings.—As was noted in these columns last week, the United Public Service Company has been incorporated under Delaware laws with a capital of $10,000,000 and will take over electric-service properties, including several in Ohio and Kentucky. The properties which the new concern will take over are those of the Light & Development Company of St. Louis outside of the State of Missouri. They include the Oberlin (Ohio) Gas & Electric Company, the Paris (Tex.) Light & Power Company, the Fort Scott (Kan.) Gas & Electric Company, the Mitchell (S. D.) Power Company the Tahlequah (Okla.) Light & Power Company, together with electric-service properties at Danville, Ky., and Ravenna, Ohio. The Light & Power Development Company of St. Louis was incorporated in 1908 under Missouri laws to manage and operate public service properties. It has an authorized capital stock of $200,000, all of which is outstanding. The properties which it retains are isolated plants in St. Louis, the Cape Girardeau (Mo.) Water Works & Electric Light Company and the Poplar Bluffs (Mo.) Electric Light & Power Company.

Vermont Hydroelectric Developments.—The Consolidated Lighting Company, of Montpelier, Vt., one of the Tenney companies, has purchased the Molly Falls Light & Power Company, of Mansfield, Vt., together with water rights at Lamberton Mills and Peacham Pond. Plans for developing some 3000 hp at Molly Falls are being made by the Consolidated company. The proposed work includes the raising of the level of Peacham Pond about 8 ft., increasing its area by 100 acres, the erection of a power house on the site of the present station at Molly Falls and the installation of a pipe line 1½ miles long to Lamberton Mills, where the existing dam will be rebuilt. The energy will be utilized in the Barre and Montpelier districts in connection with that furnished by the company's other plants.

Long Island Lighting Company's Board Re-elected.—All of the directors of the Long Island Lighting Company, which supplies the towns of Northport, Centreport, Greenlawn, Smithtown, Kings Park, Sayville, West Sayville, Bayport, Oakdale, Great River, Islip, Amityville and several other communities on Long Island, N. Y., were re-elected at the annual meeting of the stockholders at the offices of the company, 50 Church Street, N. Y., last week and the report of the president covering the year ended Dec. 31, 1912, was presented. The officers were also re-elected as follows: President, E. L. Phillips; vice-president, G. W. Olmsted; treasurer, G. E. Lott, and secretary, H. R. Frost. The first three, with G. de B. Green and C. R. Dean, compose the board of directors.

Sales Conference of Illinois Electric Company.—The first sales conference of the Illinois Electric Company of Chicago was held at the Hotel La Salle in that city during the week ended Feb. 8. Meetings were held from 9 a. m. to 6 p. m., representatives of manufacturers giving instructive talks on devices and apparatus. The evening meetings were devoted to the affairs of the Illinois Electric Company. Much interest was taken in the conference, which will be made an annual event. N. G. Harvey, general manager of the company, planned the conference and supervised all its details.

West Penn Traction & Water Power Earnings.—The statement of the West Penn Traction & Water Power Company for the year ended Dec. 31, 1912, showed the largest earnings on record for the company. Gross earnings were $3,408,586, an increase of $1,148,299; expenses and taxes, $1,829,459, an increase of $717,178; net earnings, $1,579,127, an increase of $431,121, and fixed charges, $794,748, an increase of $266,472. The surplus remaining was $549,379, an increase of $164,649.

McCrum-Howell Disbursement.—Judge Buffington in the United States Circuit Court has authorized the receivers of the McCrum-Howell Company to pay a dividend of 21.2 per cent to non-assenting creditors. This will wipe out the remaining assets and after this payment the receivers will be discharged. The company has been reorganized as the Richmond Radiator Company.

United Light & Railways Buys Iowa Companies.—Announcement has been made of the purchase of the People's Gas & Electric Company, of Mason City, Ia., and the Mason City & Clear Lake Railway Company by the United Light & Railways Company, of Grand Rapids, Mich. The latter, it is said, has also made a contract to operate the system of the Iowa & Illinois Railway Company with an option to purchase it at the end of four years. This company operates a line from Davenport to Clinton, Ia., a distance of about 40 miles. Negotiations are also understood to be in progress for the purchase of the Iowa City Gas & Electric Company. The directors of the United Light & Railways Company have declared an initial dividend of 1 per cent on the common stock, payable April 1 to holders of record March 21. The directors declared a dividend of 4 per cent for 1913, to be payable during the year in quarterly instalments, beginning with April 1.

Rubber-Covered Cable for New South Wales.—The Armorduct Manufacturing Company of Farrington Avenue, London, has just received from the Postmaster-General of New South Wales an additional order for 1115 miles of its vulcanized rubber cable.

January Statement of Copper Producers' Association

The January statement of the Copper Producers' Association, issued this week, showed an increase of 17,885,750 lb. in surplus stocks, and compared with the December statement as follows:

	January, Pounds		December, Pounds	
Stocks on hand in the United States on first of month		105,312,582		86,164,059
Production		143,479,625		143,354,042
		248,792,207		229,518,101
Domestic deliveries	65,210,030		58,491,723	
Foreign deliveries	60,383,845		65,713,796	
		125,593,875		124,205,519
Stocks on hand at end of month		123,198,332		105,312,582

NEW YORK METAL MARKET PRICES

	Feb. 4 Bid.	Feb. 4 Asked.	Feb. 11 Bid.	Feb. 11 Asked.
Copper:				
Standard pot	15.00	.....	14.50	.....
London, standard, spot	£ 67 17 6		£ 66 5 0	
Prime Lake	16.12½		15.75 to 15.87½	
Electrolytic	16.00		15.50 to 15.75	
Casting	15.87½		15.50	
Copper wire, base	17.50 to 18.00		17.50	
Lead	4.35		4.35	
Nickel	40.00 to 45.00		40.00 to 45.00	
Sheet zinc, f.o.b. smelter	8.75		8.75	
Spelter, spot	6.75		6.50	
Tin, spot	49.15		49.12½	
Aluminum:				
Prompt delivery	26.00 to 26.50		25.50 to 26.00	
Future	26.00 to 26.50		25.50 to 26.00	

OLD METALS

Heavy copper and wire	14.25	14.25
Brass, heavy	8.75	8.75
Brass, light	7.75	7.75
Lead, heavy	4.15	4.15
Zinc, scrap	5.75	5.75

COPPER EXPORTS IN FEBRUARY

Total tons to Feb. 12	12,256

Industrial Securities

Security	Capital Stock Listed	Dividend Per Cent	Dividend Period	Quotation Feb. 5	Quotation Feb. 11
Allis-Chalmers, t.r., 3d pd	$15,501,800	.....	.....	4	4
Allis-Chal., pf., t.r., 3d pd	14,105,500	.....	.....	9⅜	10
Amalgamated Copper	153,887,900	1½	Q	71¾	71¼
American Tel. & Tel.	334,887,700	2	Q	131¾	132
Electric Storage Battery, c.	16,074,425	1	Q	53½	53
General Electric	101,203,500	2	Q	142	140½
Mackay Cos., c.	41,380,400	1¼	Q	84	84*
Mackay Cos., pf.	50,000,000	1	Q	67	67*
Western Union Tel.	99,745,400	¾	Q	72½	72
Westinghouse, E. & M., c.	33,798,520	1	Q	73	71⅜
Westinghouse, E. & M., pf.	3,998,700	1¾	Q	119¼*	119¼*

*Last price quoted.

Personal

Mr. R. G. Parker has tendered his resignation as manager of the Faulkton (S. D.) light and power plant.

Mr. A. E. Cook has retired as manager of the Lake Mills (Wis.) Municipal Electric Light & Water Plant.

Mr. J. Cmylia has been appointed superintendent of the Kewaunee (Wis.) Municipal Electric Light Plant.

Mr. F. H. Andrus, superintendent of the municipal electric-lighting plant at Burlington, Vt., has tendered his resignation, effective Feb. 15.

Mr. W. C. Ross has resigned as president of the Aberdeen (S. D.) Light & Power Company. His successor is Mr. C. A. Grimmel, of Omaha, Neb.

Mr. Miles Bronson has been appointed general superintendent of the electric division of the New York Central & Hudson River Railroad Company.

Mr. Henry Koehber has been appointed chief engineer of the Auglaize Power Company, Defiance, Ohio, as successor to Mr. A. N. Libby, who has retired.

Mr. L. S. Keith, who for some time has been connected with the firm of McMeen & Miller, of Chicago, electrical engineers, has been made a member of the firm.

Mr. Garret H. Wilson has been appointed superintendent of the electric division and of the Grand Central Terminal of the New York Central & Hudson River Railroad Company.

Mr. A. S. Reed has severed his connection with the Rutland (Vt.) Railway, Light & Power Company and entered the employ of the Binghamton (N. Y.) Street Railway Company.

Mr. F. E. Watts, Jupiter of the Jovian Order, who is making a tour of the West in the interests of his organization, was tendered a dinner at Denver, Col., Feb. 12, by the Jovians of that city.

Mr. Reuben H. Barber, chief engineer of the municipal electric-light plant at Holyoke, Mass., has resigned his position and accepted a similar post with the New Bedford (Mass.) Gas & Edison Light Company.

Mr. Joseph H. Proctor, instructor in electrical engineering at the Agricultural & Mechanical College of Texas, has resigned from that institution and joined the patent department of the Westinghouse Electric & Manufacturing Company.

Mr. A. W. Hubbard, who as previously mentioned in these columns has concluded his services as manager with the Athol (Mass.) Gas & Electric Company, was presented with a Knights Templars charm by the employees of the company on Feb. 6.

Mr. Charles V. Seastone has been taken into partnership by Mr. Daniel W. Mead, consulting engineer, Madison, Wis. Mr. Seastone, who has been associated with Mr. Mead for several years, is an associate member of the American Society of Civil Engineers.

Mr. Wilbur M. Krise has been appointed general manager of the Jefferson Electric Light, Heat & Power Company of Punxsutawney, Pa. Mr. Krise, who is a graduate of Drexel Institute, was formerly connected with the commercial department of the lighting plant at Steubenville, Ohio.

Mr. S. W. Mower has become manager of the lighting companies allied with the Hartwick Power Company and the Otsego & Herkimer Railroad, succeeding Mr. A. O. Choate, resigned. The lighting companies in question are at Richfield Springs, Cooperstown and Hartwick, N. Y.

Dr. Edward P. Hyde, director of the physical laboratory of the National Electric Lamp Association, Cleveland, Ohio, lectured at the Franklin Institute Jan. 30 on "The Activities of the Laboratory of the Association in the Development of the Modern Science of Illumination."

Mr. R. J. Andrus has been appointed vice-president and general manager of the Northwest Electric & Water Works, with headquarters in Seattle, Wash. Mr. Andrus left the Pacific Power & Light Company, with which he had been associated for several years as manager of the Pasco and Kennewick branches, last spring to become new-business manager for the South Bend Electric Company and the

Montesano Light & Water Company. The Northwest Electric & Water Works is a consolidation of these properties and operates electric, gas and water utilities in western Washington.

Mr. C. C. Custer, for several years business manager and mechanical superintendent of the Miami (Ohio) Light, Heat & Power Company, which has been taken over by the Dayton Power & Light Company, has resigned, and Mr. Mason Lytle, formerly of Dayton, has been placed in charge of the local office.

Mr. Lee Murray, who recently retired from the position of general manager of Messrs. Bruce, Peebles & Co., Ltd., engineers, Edinburgh, has started business on his own account at 10 Norfolk Street, Strand, London, W. C., as engineering representative for firms and corporations in the colonies and abroad.

Mr. F. F. P. Forrest, who during the past sixteen years was connected with the Salem (Mass.) Electric Lighting Company, has severed his connection with the company to take up farming. Mr. Forrest on leaving the company was presented with a purse from his employers and fellow-employees as a token of esteem.

Mr. H. U. Wallace, well known in Iowa railroad circles and at present head of the Northern Colorado Power Company, Denver, Col., has been appointed receiver of the Denver, Laramie & Western Railroad. Mr. Wallace was at one time chief engineer of the Illinois Central Railroad and general manager of the Lake Shore Railroad.

Mr. Samuel Insull, president of the Commonwealth Edison Company of Chicago, was one of the speakers at the annual dinner of the British Electrical and Allied Manufacturers' Association at the Savoy Hotel, London, Jan. 24. He said that one of the great obstacles to the progress of electrical business in England is the lack of co-operation between electrical men in general and between the manufacturers of electrical apparatus and the suppliers of electrical energy in particular.

Mr. Albert R. Whaley has been elected vice-president of the New York, New Haven & Hartford Railroad in charge of operations. Mr. Whaley was formerly superintendent of the electric zone of the New York Central & Hudson River Railroad and was also in charge of the terminal construction. Prior to that he was superintendent of the Worcester division of the New York, New Haven & Hartford Railroad and came to have charge of the first heavy electric traction installation in this country, which was at Providence on the line between Providence and Fall River. All of the electric and terminal change-over at the Grand Central Station in New York has been done under his direction, and he had charge not only of the operation but also of the power houses, roadbed and equipment.

Mr. Parker H. Kemble has resigned the position of general sales manager of the Toronto (Ont.) Electric Light Company to accept that of manager of the commercial department of the Union Gas & Electric Company of Cincinnati, Ohio. Prior to going to Toronto Mr. Kemble was district manager of the Edison Electric Illuminating Company of Brooklyn, but his central-station experience has not been limited to these two companies. He was at one time connected with the engineering staff of the Boston Elevated Railroad Company and also rebuilt and operated the properties of the Northern Connecticut Light & Power Company of Windsor Locks, Conn. Mr. Kemble is a member of numerous engineering societies and was recently elected first vice-president of the Canadian Electrical Association and appointed Jovian Statesman for Ontario. He was educated at Harvard, at the Technology School in Dresden, Germany, and at the Massachusetts Institute of Technology.

Mr. Frank K. Wade, who as stated in the Feb. 1 issue of the *Electrical World* was appointed successor to Mr. G. H. Caffrey as superintendent of the Norwalk (Conn.) division of the United Electric Light & Water Company, entered upon his duties on Feb. 4. Mr. Wade spent four years in the mining section of the Transvaal, South Africa, installing electrical machinery for the development of both surface and deep-level mines, and also spent five years with the General Electric Company. He was formerly general superintendent of the Olean (N. Y.) Electric Light & Power Company and subsequently represented Mr. W. C. Johnson, consulting engineer, of Niagara Falls, in the installation of waterwheels, electric machinery and transmission lines for the Hannawa Falls Water Power Company at Potsdam, N. Y. During the past two years Mr. Wade was the district sales agent for the Cooper Hewitt Electric Company, Hoboken, N. J., having charge of the company's territory throughout northern New Jersey.

Mr. James Bennett, who was elected president of the Western Association of Electrical Inspectors at its St. Louis convention, Jan. 30, has for four years past served as chief electrical inspector for the Canadian Fire Underwriters' Association, with headquarters at Montreal, Canada. Mr. Bennett entered the electrical field after completing courses in a commercial college and at McGill University, joining in 1892 the forces of the Royal Electric Company, which at that time represented the Thomson-Houston Company in Canada. In 1897 he went to the Montreal Electric Company as superintendent and five years later embarked in the electrical contracting business for himself. Mr. Bennett has been a vice-president of the National Electrical Inspectors' Association since 1909 and served the Western Association of Electrical Inspectors as vice-president and chairman of the executive committee before his election as president. He is a member of the American Institute of Electrical Engineers, honorary member of the Electrical Association of the Province of Quebec, member of the electrical committee of the National Fire Protection Association and Quebec statesman for the Jovian Order. As recently announced in these columns, Mr. Bennett plans to retire from his position with the Canadian Fire Underwriters' Association on April 1, to become managing director of the Fire Prevention Company of Canada.

Mr. George C. Keech, the new president of the Electric Club of Chicago, has been a well-known figure in electrical circles in Chicago for several years. He took his electrical engineering course with the class of 1895 at the University of Michigan, of which State he is a native. After graduation he was connected with the Sawyer-Man Electric Company (now the Westinghouse Lamp Company) for four years. After that, for a period of six years, he was manager of the Chicago office of the Bryan-Marsh Company. Since 1905 he has been illuminating engineer and general sales agent for the Cooper Hewitt Electric Company, with office in Chicago. He designed and installed the first system of Cooper Hewitt lamps in Chicago and since then about 20,000 of the mercury-vapor lamps have been placed in position in Chicago and vicinity under his direction. He was one of the organizers of the Chicago Section of the Illuminating Engineering Society and was chairman of this section for the first two years of its existence. Afterward he was one of the national vice-presidents of the Illuminating Engineering Society. Mr. Keech has addressed various societies on topics connected with illumination and has prepared a number of papers on the same general subject. He designed the first street-lighting installation in the United States, using quartz-tube lamps, and his hobby is the high mounting of large units for street lighting. He was elected president of the Electric Club of Chicago on Feb. 6.

GEORGE C. KEECH

Obituary

Mr. John Fritz, the noted steel-mill engineer, known the country over as "Uncle John," died at his home in Bethlehem, Pa., on Wednesday evening, Feb. 12, aged ninety years.

Construction

BESSEMER, ALA.—The Republic Iron & Steel Co. is preparing to nake extensive improvements at its mines on Red Mountain at Raimund. It is understood that electrically driven machinery will be installed to replace steam in a number of places in the mines. Energy will be supplied from the power plant of the Birmingham Ry., Lt. & Pwr. Co. in Birmingham.

PHOENIX, ARIZ.—The Arizona Corporation Commission has instructed the Phoenix St. Ry. Co. to reconstruct and equip completely its street railway system here. The system will also be extended.

WYNNE, ARK.—Proposals will be received by the Board of Commissioners of Water and Light District No. 2 and Sanitary Sewer District No. 1 until Feb. 24 for construction of certain improvements as follows: One artesian well; electric motor and pump erected in pump pit; power house extension; 12,000 ft. 8-in., 11,400 ft. 6-in. and 8930 ft. 4-in. cast-iron pipe line; 41 standard fire hydrants, 25 valves, two high-speed engines, horizontal return tubular boiler, two generators, switchboards, street-lighting system, 5 miles pole-line construction, transformers and supplies; 5620 ft. 15-in., 3050 ft. 12-in., 2650 ft. 10-in., 16,000 ft. 8-in., 13,200 ft. 6-in. sewer pipe, 73 manholes, 2 special manholes, 40 lamp holes and 24 flush tanks. Plans and specifications are on file at the office of the secretary of the Board of Commissioners, Wynne, and at the office of R. C. Huston & Co., consulting engineers, Exchange Building, Memphis, Tenn. C. B. Bailey is secretary of board.

BARSTOW, CAL.—The Barstow Utility Co. has applied to the State Railroad Commission for authority to sell its electric plant and distribution system to the Southern Sierras Pwr. Co., of San Bernardino, which has a 110,000-volt transmission line passing near Barstow.

FRESNO, CAL.—The Fresno, Hanford & Summit Lake Interurban Ry. Co. has applied to the State Railroad Commission for authority to issue $1,250,000 in bonds, the proceeds to be used for the construction of an electric railway running from Fresno to Centerville, thence to Kingsburg, a distance of about 40 miles.

LOS ANGELES, CAL.—Bids will be received by the Board of Public Works for the installation of an ornamental street-lighting system on Seventh Street from Los Angeles River to Hoover Street, a distance of about 3 miles.

LOS ANGELES, CAL.—The State Railroad Commission has granted the Southern California Pwr. Co. authority to issue $2,500,000 in bonds, of which more than $1,000,000 will be used in completing the installation of a new unit at the Long Beach plant. The remainder will be devoted to new construction and improvements.

LOS ANGELES, CAL.—The municipal railway committee of Los Angeles has adopted the report of F. D. Howell, consulting engineer, recommending the construction of an electric belt railway line through the industrial district of the city in connection with the proposed municipal freight railway to the harbor at San Pedro. The city plans to begin this work at an early date.

OROVILLE, CAL.—The Oro Wtr., Lt. & Pwr. Co. is planning to build an electrically operated dredger, to cost about $75,000.

PASADENA, CAL.—The officials of the Home Tel. & Teleg. Co. have announced that improvements will be made to its system involving an expenditure of $260,000.

RANDSBURG, CAL.—The Southern Sierras Power Co. contemplates extending its transmission lines into the Randsburg district and the construction of new power plants along the Owens River.

SAN ANDREAS, CAL.—The Oro El. Corpn., of Oroville, has applied to the Board of Supervisors of Calaveras County for a franchise to erect and maintain transmission lines along certain roads and highways of the county. Bids for the above franchise will be received until March 3.

SAN JACINTO, CAL.—The city officials are planning to have a large number of street lamps installed in the near future.

SIERRA CITY, CAL.—Dennis Phelan, managing director of the Sierra Mercantile, Pwr. & Mining Co., is planning to erect an electric power plant to furnish electricity to operate the machinery in the Sacred Mound mine and mill.

TULARE, CAL.—The Big Four Railroad has applied to the State Railroad Commission for permission to issue $300,000 in bonds, the proceeds to be used for the construction of an electric railway from Tulare to Visalia, a distance of 15 miles, and from Tulare to Porterville, a distance of about 20 miles.

VISALIA, CAL.—The Southern Pacific Co. is planning to extend the Visalia El. R. R. Co.'s lines through Dunnigan Gap to Fresno.

NEW HARTFORD, CONN.—Arrangements are being made by E. A. Perkins, of Torrington, for extending the electric-light system in New Hartford. Mr. Perkins proposes to install a larger engine and generator. Work has begun on the erection of lines through Pine Meadow to the Gilman Railroad crossing. It is proposed to furnish a 24-hour service.

NEW HAVEN, CONN.—Arrangements have been completed whereby the United Illg. Co. of New Haven will extend its electric-lighting service to Woodbridge, a suburb of New Haven, in the near future.

NEW HAVEN, CONN.—Plans have been completed by C. E. Townsend, architect, for additions and alterations to the Grand Avenue power station of the United Illg. Co. The building will be 58 ft. by 80 ft., one story high. Bids, it is understood, will be asked for at once.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Feb. 25, for furnishing at the various navy yards and naval stations supplies as follows: Boston, Mass., Schedule 5160—electric welding apparatus; Schedule 5161—one hydraulic pump, one foundry rotary blower, one steam-driven air compressor, one hydraulic pipe-bending press, one hydraulic steam forging press; Schedule 5174—38,000 lb. galvanized crucible cast-steel wire. Washington, D. C., Schedule 5165—miscellaneous single-conductor cable; Schedule 5167—miscellaneous brass globe valves. Brooklyn, N. Y., Schedule 5159—eight radio sets; Schedule 5174—11 electric portable drills; Schedule 5175—3900 lb. seamless drawn brass pipe, 750 lb. seamless drawn brass tubing, 490 lb. seamless drawn copper tubing; Schedule 5170—10,400 lb. lead pipe; Schedule 5171—miscellaneous seamless drawn galvanized steel tubing. Schedules can be obtained upon application to the navy pay office nearest each navy yard. T. J. Cowie is paymaster general, U. S. N.

WILLISTON, FLA.—The Williston Mfg. Co. has been granted a franchise to install an electric-light plant here.

ATLANTA, GA.—Negotiations are pending for the transfer of the Georgia property of the Tennessee Pwr. Co., of Cleveland, Tenn., to the Georgia Pwr. Co. The transfer will include about 58 miles of transmission lines, the entire holdings of the Tennessee Pwr. Co. in Georgia. J. A. Cunningham, of Cleveland, is superintendent of the Tennessee Pwr. Co.

ABINGDON, ILL.—The Abingdon Lt. & Pwr. Co. is reported to have sold its electric-light plant here to the Illinois Trac. System for $60,000. Franchises to supply energy to St. Augustine and Prairie City are also included in the transfer.

ABINGDON, ILL.—A new switchboard and underground cables are among the improvements contemplated by E. S. Cheadle, of Joliet, and E. S. Sterrett, of Henry, who have purchased the plant of the Union Mutual Tel. Co. from L. E. Cutler.

ALTON, ILL.—The city officials are contemplating the installation of a flashlight police signal system in Alton.

ARCOLA, ILL.—The Board of Highway Commissioners of Arcola Township has granted the Central Illinois Pub. Ser. Co., of Mattoon, a franchise to erect transmission lines on the highways of the town.

BEARDSTOWN, ILL.—The Central Illinois Pub. Ser. Co., of Mattoon, has purchased two 250-hp Heine water-tube boilers for its local plant. A new 650-kw turbine engine, motor-generator set and generator will be installed. Contracts have been secured by the company for furnishing electricity to operate the pumping stations in the Big Swan and Hillview drainage districts near Winchester, and energy will be supplied to the local plant.

CISSNA PARK, ILL.—The Central Illinois Utilities Co., of Watseka, has applied to the Village Board for a 30-year franchise to operate an electric-light system here. The company offers to furnish a 24-hour service.

DECATUR, ILL.—An application has been filed with the city clerk by Frank L. Suffern for a franchise to construct and operate an electric-light plant here. A company has been incorporated with a capital stock of $50,000 and the following officers: Frank L. Suffern, president; G. W. Mueller, vice-president, and E. L. Suffern, secretary.

FREEPORT, ILL.—The Freeport Ry. & Lt. Co. is placing in service the third waterwheel at its power plant on the Pecatonica River at Brown's Mill and contemplates adding another.

MACOMB, ILL.—A committee appointed by the City Council is making investigations with a view of installing an engine, generator and other electrical equipment at the city water pumping station to supply electricity for street lighting.

NOKOMIS, ILL.—The city officials are considering the question of establishing a municipal electric-light plant.

PANA, ILL.—The City Council has offered the Central Illinois Pub. Ser. Co. a contract for lighting the streets at $60 per year for arc lamps of 2000 cp. The present rate is $72 each per year.

PERRY, ILL.—The Central Illinois Pub. Ser. Co., of Mattoon, Ill., is seeking a franchise to operate an electric-light plant in Perry.

QUINCY, ILL.—The Central Union Tel. Co. has announced that it will install a telephone and flashlight alarm system for the Police Department.

QUINCY, ILL.—Negotiations are under way between the Quincy Gas, El. & Htg. Co. and the Mississippi River Pwr. Co., of Keokuk, Ia., for the distribution of energy generated at the plant at the Keokuk (Ia.) dam by the local company.

ROCKFORD, ILL.—Robert H. Tinker has sold his water-power holdings to George D. Roper, W. H. Gaffney and M. J. Green. Three new wheels will be installed and extensive electrical equipment added. A four-story concrete building will be erected.

ROODHOUSE, ILL.—The Chicago & Alton Ry. Co. has entered into a contract with the Central Illinois Pub. Ser. Co. whereby the latter will furnish electricity for lighting the local yards, station and division shop buildings and for driving machinery, turntables and pumping water for the railroad company.

SPRINGFIELD, ILL.—Residents on Eighth Street between Reynolds Street and the Illinois State Fair Grounds, a distance of about 20 blocks, and residents on Monroe Street between Tenth Street and Amos Aveune (20 blocks) have filed petitions with the City Commission asking that ornamental lamps be installed on those thoroughfares.

SUMMIT, ILL.—The Board of Trustees has awarded the contract for the construction and equipment of substation, complete, and installation of series tungsten street-lighting system for Summit and Argo, Ill., to the W. A. Jackson Co., Old Colony Building, Chicago, Ill.

TOLONO, ILL.—The Central Illinois Pub. Ser. Co., of Mattoon, has petitioned the Village Board for a 50-year franchise to furnish electricity in Tolono. It is proposed to change the street-lighting system.

WASHINGTON, ILL.—The Washington Home Tel. Co. contemplates the installation of a new switchboard. C. H. Cheadle, of Joliet, is secretary and treasurer.

WATSEKA, ILL.—The Central Utilities Co. has commenced work on the erection of a transmission line from Sheldon to Gilman.

CAMANCHE, IA.—The City Council has granted the Iowa & Illinois Ry. Co. a 25-year franchise to operate an electric-lighting system in Camanche. The company has also been given a ten-year contract for lighting the streets of the city.

CEDAR FALLS, IA.—A special election will be held Feb. 24 to submit the proposition to issue bonds to the amount of $50,000 for the installation of a municipal electric-light plant to a vote.

CEDAR RAPIDS, IA.—The Cedar Rapids & Marion Tel. Co. will rebuild its West Side lines. The work will include the installation of new cables and building a half mile of conduits; the cost is estimated at about $33,000.

DAVENPORT, IA.—An agreement has been entered into between the Iowa & Illinois Ry. Co. and the Davenport-Muscatine Interurban Ry. Co. whereby the former will be re-organized and operated as a part of the new interurban service between Clinton and Davenport and Davenport and Muscatine. Power will be furnished by the Tri-City Ry. & Lt. Co., which will install additional equipment. The company contemplates furnishing electricity for lamps and motors to towns along the route of the Iowa & Illinois Ry. Co. P. P. Crafts is general manager of both companies.

EARLY, IA.—Arrangements are being made for a survey of the town for the purpose of making an estimate of the cost of installing an electric-light plant.

IOWA FALLS, IA.—The property of the Iowa Falls Ht., Lt. & Pwr. Co., of Iowa Falls, will be sold at sheriff's sale at Eldora March 1. The company is successor to the Petersen El. Lt. & Htg. Co.

KEOKUK, IA.—The directors of the Mississippi River Pwr. Co. are contemplating issuing about $6,500,000 additional capital stock to carry out plans for the completion of its large hydroelectric project at Keokuk, on the Mississippi River. Of this amount $4,500,000 will be required because of changes made in construction designs and to carry out plans for further installation of generating units. Allowances for excess in construction cost and interest charges during construction will add about $2,000,000 more.

OELWEIN, IA.—The Oelwein Lt., Ht. & Pwr. Co. has entered into a contract with the Chicago Great Western R. R. Co. whereby the local company will secure electricity for its system from the electric plant at the shops of the Chicago Great Western R. R. Co. For the present the single-phase and three-phase system will be used, but as soon as wires are erected the Oelwein company will use energy generated at the railway plant exclusively. William Walker is superintendent of the Oelwein company.

ROCKWELL, IA.—A special election will be called to vote on the proposition to grant a 20-year franchise to C. C. Carhart, of Sheffield, to furnish electricity here. The service will be supplied from Mr. Carhart's plant in Sheffield.

SUTHERLAND, IA.—At an election to be held Feb. 17 the proposition to grant the Peterson Pwr. & Milling Co., of Peterson City, a franchise to erect an electric distributing system in Sutherland will be submitted to a vote.

VALLEY JUNCTION, IA.—The City Council has decided to call a special election on March 14 to vote on the proposition to issue $65,000 in bonds, the proceeds to be used to purchase or construct an electric-light plant and water-works system.

CIMARRON, KAN.—Bonds to the amount of $15,000 have been voted for municipal improvements. An electric-light plant is among the improvements contemplated.

KANOPOLIS, KAN.—A committee has been appointed by the Council to make investigations relative to the installation of an electric-light plant in Kanopolis. A. E. Sturgis is a member of the committee.

MOLINE, KAN.—I. C. Bushong, of Ottawa, Kan., has been awarded a contract to install an electric-light plant in Moline, to cost about $15,000. The plant will be equipped with two dynamos, one rated at 60 kva and the other at 10 kva.

WAMEGO, KAN.—The J. H. Bennett Barrel & Heading Works, of Wamego, has purchased a 30-hp, 60-cycle, 220-volt, single-phase motor with transformer and controlling apparatus for use in connection with their plant here. Energy for operating the works will be supplied by the municipal electric plant. D. A. Course is superintendent of Light and Water Department.

ASHLAND, KY.—The Ohio Valley El. Ry. Co., of Ashland, Ky., is negotiating with the Town Trustees for a franchise to supply electricity in Russell and for a contract for lighting the town.

EMINENCE, KY.—The property of the Eminence El. Lt. Co. has been purchased by the Kentucky Utilities Co., of Lexington. The new company will immediately make improvements to the plant and furnish a 24-hour service. The company also contemplates extending its service to Pleasureville and New Castle.

LEXINGTON, KY.—The Lexington Utilities Co. has applied for a franchise to extend its transmission lines from Lexington into different parts of Fayette County.

RICHMOND, KY.—The property of the Richmond El. & Pwr. Co. has been purchased by the Middle West Utilities Co., of Lexington, controllel by the Insull interests of Chicago, Ill.

RUSSELL, KY.—The American Ry. Co., which owns the Ohio Valley El. Ry. Co., of Ashland, Ky., has opened negotiations with the city of Russell to furnish electricity for lamps and motors here. Russell is to be the terminal of the company's traction lines in this region.

RUSSELL, KY.—The Tygart Valley Wtr. Pwr. & El. Co., of Carter County, has practically completed its plans for extensive water-power developments in the neighborhood of Russell. The company was recently incorporated by D. H. Hall, W. F. Carter, George Snider and W. W. Carter and controls valuable power sites at the falls in the Tygart Creek.

LINCOLN, MAINE.—An act has been introduced in the State Legislature to incorporate the Lincoln Lt. & Pwr. Co. with George H. Haines and Austin G. Haines as incorporators. The company is to be capitalized at $10,000 and to have the power to furnish electricity for lamps, heaters and motors in Lincoln.

SOUTH BERWICK, MAINE.—A bill has been introduced in the Legislature to authorize the town of South Berwick to own and operate an electric-light and power plant.

ANNAPOLIS, MD.—The City Council has granted a franchise to the Annapolis Public Utilities Co., a subsidiary of the Washington, Baltimore & Annapolis El. Rys. Co. The franchise is for a period of 50 years and gives the company the right to furnish both electricity and gas for lighting and power purposes. The Utility company will purchase the plant of the old company, which will be used only as a distributing station. It will be remodeled and new machinery installed. Energy for operating the local system will be secured from the Potomac power plant, which supplies the railway company.

CHICOPEE, MASS.—The Board of Aldermen has granted the Warren Pwr. Co. a franchise, together with locations for several hundred poles petitioned for, to furnish electricity in Chicopee. John T. MacDonnell is treasurer. The office of the Warren company is at 62 Stebbins Street, Springfield.

NEWBURYPORT, MASS.—The City Council has asked the Newburyport Gas & El. Co. to submit estimates of the most of maintaining the extra lamps required for the proposed ornamental street-lighting system.

BLOOMINGDALE, MICH.—A franchise has been granted to M. C. Hawk for the installation of an electric-light and power plant here. Work will begin immediately on construction of the propsed plant.

CHEBOYGAN, MICH.—The Cheboygan El. Lt. & Pwr. Co. will erect about 15 miles of three-phase, 12,000-volt transmission line and rebuild about 6 miles (this year) of old line. Other work has been planned by the company, but it has not yet decided upon the time of beginning construction.

CHELSEA, MICH.—The question of changing the system of the municipal electric-light plant from direct to alternating current is reported to be under consideration.

DETROIT, MICH.—The Public Lighting Commission has asked the city controller for an appropriation of $119,500 for the installation of a 5000-kw turbo-generator unit in the municipal electric-light plant. An appropriation is also asked for the installation of 393 lamps, to be erected in different parts of the city, involving an expenditure of about $130,000.

ELKTON, MICH.—The city has purchased an engine and a 30-kw Westinghouse generator for the municipal plant.

HASTINGS, MICH.—The City Council has passed a resolution calling an election in April to vote on the proposition to issue $90,000 in bonds for a municipal lighting plant. Lighting service is now supplied by the Thornapple Gas & El. Lt. Co., of which Lewis Heath is local manager.

KALAMAZOO, MICH.—The contract for furnishing electrical equipment for the municipal electric-light plant was awarded to the Fort Wayne Electric Works, of Fort Wayne, Ind., for $62,500. The equipment includes generators, rectifiers, switchboard, lamps, cut-outs, condensers and boilers. Work will start at once on improvements to the plant.

MANISTEE, MICH.—The State Railroad Commission has given its approval of the consolidation of the Manistee Lt. & Pwr. Co. and the Manistee Ry. Co. and has authorized the issuance of $100,000 in bonds, the proceeds to be used for improvements.

MARSHALL, MICH.—The City Council has authorized an expenditure of $1,250 for improvements to the municipal electric plant and the installation of new lamps.

MONTAGUE, MICH.—Wernette & Bradfield, Housman Block, Grand Rapids, Mich., it is reported, are preparing plans for construction of a power plant for the White Lake Lt. & Pwr. Co. in Montague. The cost of the proposed plant is estimated at $100,000.

ST. CLAIR FLATS (P. O., DETROIT), MICH.—Plans are being prepared for the installation of an electric-light plant in the Star Island

House, recently sold to Walter Lemke. It is understood that bids will soon be called for the proposed plant.

FERGUS FALLS, MINN.—The Otter Tail Pwr. Co. is planning to extend its transmission lines to Herman, Donnelly and Morris.

GROVE CITY, MINN.—The installation of an electric-light plant in Grove City is under consideration.

JACKSON, MINN.—The Commercial Club has petitioned the Council to submit the proposition to issue $15,000 in bonds, the proceeds to be used to build a new dam to furnish power for the municipal electric-light plant, to the voters at the spring election.

MINNEAPOLIS, MINN.—The public lighting committee has recommended to the City Council the installation of 100 new arc lamps, to be distributed in different parts of the city.

WAVERLY, MINN.—The Central Minnesota Lt. & Pwr. Co. has submitted a proposition to the city to establish an electric-light plant here.

ST. CHARLES, MO.—A special election will be called to submit to the voters the proposition to grant Charles S. Ruffner, representing the Mississippi River Pwr. Co., of Keokuk, Ia., a franchise to distribute electricity for lamps and motors in St. Charles.

ST. LOUIS, MO.—The Lt. & Devel. Co., of St. Louis, which owns and operates electric-light and power plants in several small towns in Missouri and surounding states, has filed notice of increase in capital stock from $1,000,000 to $1,500,000. Hugo Wurdack, of St. Louis, is president.

ARLINGTON, NEB.—An effort is being made to organize a stock company to take over the plant of the Arlington El. Lt. Co., which is operated by A. G. Ludwig. A steam-heating plant is operated in connection with the electric plant.

BASSETT, NEB.—Preparations are being made for the construction of an electric-light plant in Bassett, to cost about $16,000, bids for which have been asked. The Alamo Engine Co., of Omaha, Neb., has charge of the work. W. E. Buckendorf is city clerk.

OREANA, NEV.—Plans are being prepared for the erection of a power plant at Oreana to supply electricity for lamps and motors to the mines at the head of Rochester Canyon and Lincoln Hill. Joseph Nenzel is interested in the project. Oreana has not a post office.

RENO, NEV.—The Nevada Pwr. Co., promoted by Oakland capitalists and associated with the Mono Valley Pwr. & Lt. Co., has filed a trust deed amounting to $3,000,000 to secure a bond issue of like amount. The company proposes to furnish power in Reno and other places in Nevada.

BOONTON, N. J.—The Eastern Pennsylvania Pwr. Co., of Easton, Pa., contemplates utilizing the water-power at Boonton to generate electricity to meet the demand for electrical service in this part of the State.

HOPE, N. J.—Having been unable to induce the Hackettstown El. Lt. Co. to extend its service to the village of Hope, local business men have taken steps to organize a company to establish an independent plant to furnish electricity to light the town. It is proposed to utilize the water-power of the old Moravian mill to operate the plant.

JERSEY CITY, N. J.—Arrangements have been made for the installation of ornamental street lamps on Newark Avenue. The lamps will be installed by the Public Service El. Co. It is expected to have the lamps erected by March 15.

JERSEY CITY, N. J.—Plans are being considered by Supervisor O'Mealia and the Board of Freeholders for furnishing electricity for maintaining the lamps in the county parks, roads and institutions from the court house power plant. It is proposed to install additional equipment in the power plant to provide for the additional service.

MONTCLAIR, N. J.—Bids will be received by Harry Trippett, town clerk, Montclair, until Feb. 24 for miscellaneous work in connection with the new municipal building, for the use of the Police and Fire Departments and other municipal purposes, as follows: (1) For furnishing and installing necessary equipment of the new council chamber, including desks, seats, etc.; (2) for furnishing and installing all lighting fixtures necessary for the building. Plans and specifications are on file at office of O. F. Semsch, Crane Building, Bloomfield Avenue, Montclair, and 109 Broad Street, New York, N. Y., copies of which can be obtained upon deposit of $5, $3 of which will be refunded upon return of plans.

NORTH ARLINGTON, N. J.—The Borough Council has entered into a contract with the Public Service El. Co. for lighting the streets of the borough. The contract provides for 62 lamps of 80 cp at $1,833 per year. North Arlington has not a post office.

PORT MURRAY, N. J.—The National Fireproofing Co. will install an electric-light plant at its works in Port Murray. A large addition will be made to the factory.

ALBUQUERQUE, N. M.—Improvements are contemplated in the electric plant of the Albuquerque Gas, El. Lt. & Pwr. Co. The work will include replacing three old boilers with two 300-hp water-tube boilers especially designed to burn wood pulp, remodeling the air-pressure conveyor, etc. A. F. Van Diense is manager.

TUCUMCARI, N. M.—The Tucumcari Lt. & Pwr. Co. contemplates enlarging its light and power plant here.

BAY SHORE, N. Y.—The Suffolk Gas & El. Co., of Bay Shore, has received authority from the Public Service Commission, Second District, to issue bonds to the par value of $134,000, to be sold at not less than 87, the proceeds to be used for the extension of its transmission line from Bay Shore to Babylon, from Bay Shore to Sayville and from Sayville to Bayport, and for distribution lines and necessary apparatus and supplies. The company operates in the towns of Islip, East Islip and Bay Shore.

BROOKLYN, N. Y.—Bids will be received by C. B. J. Snyder, superintendent of school buildings, Department of Education, corner of Park Avenue and Fifty-ninth Street, borough of Manhattan, New York, until Feb. 24, as follows: (1) For installing electric equipment in new Public School 172, on Fourth Avenue, between Twenty-ninth and Thirtieth Streets, borough of Brooklyn. (2)—Item 1—For installing heating and ventilating apparatus; item 2—installing temperature regulation in new Public School 175 on Blake Avenue, between Bristol Street and Hopkinson Avenue, borough of Brooklyn. Blank forms, plans and specifications may be obtained or seen at the office of the superintendent, Park Avenue and Fifty-ninth Street, borough of Manhattan, and also at branch office, 131 Livingston Street, Brooklyn.

CANASERAGA, N. Y.—Surveys are being made for the installation of an electric-light system in this village. Energy to operate the proposed system will be transmitted from Bennett Mill Falls.

HEMPSTEAD, N. Y.—Members of the Business Men's Association of Hempstead and other residents are considering the question of establishing a municipal electric-light plant in connection with the present pumping station. Electrical service is now supplied by the Nassau & Suffolk Ltg. Co. and the Nassau Lt. & Pwr. Co., of Mineola.

MILFORD, N. Y.—Negotiations are under way between the Village Board and the Clinton Mills Pwr. Co., of Cooperstown, for lighting the village with electricity. It is proposed to use incandescent lamps for street-lighting.

POTSDAM, N. Y.—The Public Service Commission, Second District, has authorized the Northern Pwr. Co., of Potsdam, to increase its capital stock from $100,000 to $500,000, the proceeds of $143,000 to be used for payment of outstanding indebtedness; for general expenses in connection with the development of the property, $15,000, and for new construction, $158,000.

STAMFORD, N. Y.—The West Branch Lt. & Pwr. Co. is preparing to extend its transmission line from Wolcott down the north side of the river to the farm of Clarence Gould to supply electricity for lamps to farmers in that vicinity.

CHARLOTTE, N. C.—The Southern Pwr. Co. has closed a contract with the Georgia Ry. & Pwr. Co. whereby it will take over 14,000 hp of energy generated at the Tallulah Falls power station, beginning Sept. 1. The Southern Pwr. Co. will erect a transmission line from Easley, S. C., the present terminus, about 15 miles southwest of Greenville, through Liberty, Central and other South Carolina towns to Tallulah Falls. W. S. Lee is vice-president and chief engineer of the Southern Pwr. Co.

CHERRYVILLE, N. C.—The city is considering the question of calling an election to vote on the proposition to issue $45,000 in bonds for municipal improvements. It is proposed to purchase the lighting plant owned by Kendrick Brothers and light the streets of the city, construct water-works, improve streets and erect school.

CLAYTON, N. C.—Proposals will be received by the Mayor and Board of Commissioners of the town of Clayton until Feb. 25 for construction of water-works, electric-light plant and sewerage system as follows: The water-works system will include fireproof building, power pumps, clear-water basin and about 4 miles of 6-in., 8-in. and 10-in. water pipe to be laid with hydrants and valves; the electric-light plant will consist of 5 miles of pole lines and a 100-kw transformer station; the sewer system calls for about 3 miles of pipe sewers, 8 in. to 15 in. in diameter, and appurtenances. Plans and specifications are on file at the office of the Mayor at Clayton and at the office of Gilbert C. White, engineer, Charlotte, N. C.

HICKORY, N. C.—The Southern Pwr. Co., of Charlotte, has purchased the property of the Thornton Lt. & Pwr. Co. W. S. Lee is general manager and chief engineer of the Southern Pwr. Co.

FARGO, N. D.—A bill has been introduced into the State Legislature by Senator Porterfield providing for the installation of a 150-kw generator and engine to furnish electricity for lighting the buildings and campus at the North Dakota Agricultural College and for conduits and posts for lighting the campus. The cost is estimated at $10,500.

AKRON, OHIO.—Plans have been prepared for the installation of an ornamental street-lighting system in the business district. The new lamps will be installed by the lighting company; the city will pay 20 per cent of the cost of maintenance and the merchants 80 per cent.

CLEVELAND, OHIO.—Service Director Kinnear will employ a consulting engineer to supervise the construction of the extension of the municipal light plant when funds are available through the $265,000 bond issue, an ordinance for which has been introduced in Council.

COLUMBUS, OHIO.—The finance committee of the City Council has approved a bond issue of $30,000, the proceeds to be used for installing new street lamps in outlying districts of Columbus.

NELSONVILLE, OHIO.—The Hocking Pwr. Co. has applied to the Public Service Commission for authority to issue $90,000 in capital stock, the proceeds to be used to take over the plant and business of the John A. Stewart El. Co. at Nelsonville.

PIQUA, OHIO.—Estimates of costs of installing ornamental street lamps on Main and Wayne Streets, between Sycamore and Greene Street, and the cross-streets, Water, High and Ash, are being prepared by the Miami Lt., Ht. & Pwr. Co.

ALBANY, ORE.—The City Council has engaged Louis C. Kelsey, of Portland, civil engineer, to prepare preliminary estimates of the cost of installing a municipal electric-light plant (steam-driven) to provide electricity for lighting the business section of the city with 600 standards carrying cluster lamps.

HOOD RIVER, ORE.—The Hydro-Electric Co. has been granted permission to erect electric transmission lines on certain highways of Wasco County. Work will soon begin on construction of the lines.

PORTLAND, ORE.—Plans are being prepared by the Pacific Tel. & Teleg. Co. for the erection of a substation in the Lents district, Portland, to cost about $30,000.

BOILING SPRINGS, PA.—The Boiling Springs El. Lt. Co. is planning to install a new low-speed generator at its plant.

GREEN LANE, PA.—The Green Lane Lt., Ht. & Pwr. Co., recently organized, will secure electricity to operate its system from the municipal electric plant in Pennsburg. J. B. Holden is interested in the company.

HARRISBURG, PA.—The special light committee of the Council is considering the question of installing a new type of arc lamps in the business district.

HAWLEY, PA.—The State Department has approved the merger of the Wallen-Paupack Pwr. Co. and the Paupack Pwr. Co., of Scranton, under the name of the New York, Pennsylvania and New Jersey Pwr. Co. The company is capitalized at $450,000 and was formed by Scranton men. The merged companies hold land and water rights along the Paupack River near Hawley and propose to supply electricity for lamps and motors to towns and cities in the three states.

JOHNSTOWN, PA.—Mayor Cauffiel has given his approval of the franchise of the Dale Lt., Ht. & Pwr. Co. passed by the Common Council on Jan. 21 giving the company permission to extend its system into all districts of the city.

LOCK HAVEN, PA.—The City Council has adopted the recommendation of the light and sanitary committee of the City Council for the installation of an ornamental street-lighting system from Canal Park to Monument Place. Two propositions have been submitted by the Lock Haven El. Lt. & Pwr. Co. for installing the proposed system, as follows: The company offers to furnish electricity to maintain 43 standards (more or less) each carrying five 60-watt Mazda lamps at $20 per standard per year, the city to furnish all mechanical work and material; (2) the company will furnish electricity for the above standards for $25 each per year and will furnish all electrical material and electrical labor for installing same, provided the city will enter into a ten-year contract. The cost of the electrical material is estimated at $2,000; the cost of conduit to be built by the city is estimated at $1,500. The funds with which to purchase the lamp standards will be raised by the Board of Trade.

PHILADELPHIA, PA.—The capacity of the Philadelphia Hydro-Electric Co. is to be increased to 3500 kw. The company will also erect a 1500-kw hydroelectric plant at Norristown.

POTTSVILLE, PA.—The Pottsville Union Trac. Co. is planning to extend its electric railway from Pottsville to Shenandoah over the summit of Broad Mountain. The stockholders have authorized a loan of $1,000,000 to provide funds for same.

SHENANDOAH, PA.—The Schuylkill Gas & El. Co., a subsidiary of the Harwood El. Co., of Hazleton, has closed negotiations whereby it will take over the Shenandoah light, heat and power plant and the property of the Mahanoy City Lt., Ht. & Pwr. Co. April 10. This gives the Harwood company complete control of lighting companies in this and the Hazleton regions.

WAPWALLOPEN, PA.—The Heller Mining Co. has submitted a proposition to the town authorities offering to generate electricity for lighting the town provided the town will purchase and distribute same.

SPARTANBURG, S. C.—The Manufacturers' Pwr. Co. has been granted permission to supply electricity for lamps and motors in Spartanburg. All wires in this city will be placed underground. The company is interested in a hydroelectric development on Green River, near Saluda, N. C. W. S. Montgomery, of Spartanburg, is president of the company.

ARTESIAN, S. D.—The question of installing an electric-light system in Artesian is under consideration.

GEDDES, S. D.—The power company, which has leased the local electric-light plant, is contemplating establishing a central power plant from which to furnish electricity in Geddes, Platte, Armour, Scotland and other towns in this vicinity.

HETLAND, S. D.—The installation of an electric-lighting system in Hetland is under consideration.

SELBY, S. D.—Sealed bids will be received at the office of H. A. Taylor, county auditor, until March 4, for lighting fixtures for the court house and jail, the cost installed not to exceed $750. Bids will also be received at the same time for equipment for electric-light plant for court house as follows: For one 10-hp gasoline engine, one 5-kw nonflicker dynamo, 700 r.p.m.; one V-5 storage battery with charging panels, two for each cell, complete (rating of storage battery: 40 lamps three hours, 28 lamps five hours, 20 lamps eight hours, based on 16-cp tungsten lamps); one switchboard with battery charging connections. The plant is to have sufficient output to maintain 200 lamps of 16 cp.

JOHNSON CITY, TENN.—The City Council has instructed City Attorney George C. Sells to draft a bill to be presented to the State Legislature allowing the city to issue bonds to build and operate a lighting plant.

AMARILLO, TEX.—Henry L. Doherty & Co., of New York, N. Y., has purchased the property of the Amarillo St. Ry. Co. for $200,000. The new owners will extend the lines and make other improvements to the system.

CUERO, TEX.—The Guadalupe Wtr. Pwr. Co. is seeking authority from the State Legislature to build five dams on the Guadalupe River for the purpose of providing water storage supply to operate hydroelectric plants which it proposes to install.

DENTON, TEX.—The City Council has granted J. T. Witt and associates a franchise to construct an interurban railway between Denton and the suburb of Cement City.

FORT WORTH, TEX.—Arrangements are being made by the Fort Worth Pwr. & Lt. Co. to enlarge its plant on Trinity River. Orders have been placed for a 10,000-hp turbine. The plant now has an output of 25,000 hp.

MANOR, TEX.—W. M. Allison is constructing an electric-light plant in Manor to furnish electricity for lighting the town. The equipment will consist of a 35-hp oil engine (Tifs & Co.), a 45-kw, 2300-volt, 133-cycle Westinghouse generator, with 2½-kw exciter and four 2½-kw transformers. Overhead line material will consist of 22,000 ft. of wire, red cedar poles and about 400 25-watt lamps.

OGDEN, UTAH.—Having provided an additional water supply by raising the dam in Ogden Canyon, the Utah Lt. & Ry. Co. is now preparing to install additional machinery at its hydroelectric plant on Twelfth Street which will double the output of the plant. O. H. Honnold is electrical engineer and C. A. Kohn superintendent of power stations, both of Salt Lake City.

MARSHFIELD, VT.—The Consol. Ltg. Co., of Montpelier, in connection with the Charles Tenney Co., of Boston, Mass., has purchased the property of the Molly Falls Lt. & Pwr. Co., of Marshfield, which has a development at Molly Falls and furnishes electricity in Marshfield, Plainfield, Upper and Lower Cabot. The company has also purchased certain rights owned by Fred G. Lamberton, at Lamberton Mills, and by George May, around Peacham Pond, and others. An extensive hydroelectric development at Molly Falls is planned by the Consol. Ltg. Co. The plans contemplate the construction of a new power house on the site of the present power station of the Molly Falls company and building a new penstock 7700 ft. long to the Lamberton mill, where the dam will be rebuilt and the storage capacity increased. Work may not be started on the project until next year. H. Larrabee, of Montpelier, is manager of the Consol. Ltg. Co.

ELIZABETH CITY, VA.—Application will be made to the State Legislature asking for an amendment to the charter of the city of Elizabeth City providing for a bond issue not to exceed $250,000 for the purchase of an electric-light plant and water-works system.

SEATTLE, WASH.—The City Council has rejected the proposition to submit for approval at the March election a $2,000,000 bond issue to provide funds to build a municipal telephone system.

BENWOOD, W. VA.—The Wheeling Electrical Co., of Wheeling, has applied to the City Council for a franchise to supply electricity for lamps and motors in Benwood. John B. Garden, of Wheeling, is general manager of the company.

MOOREFIELD, W. VA.—At a special election held Feb. 1 the proposition to issue bonds for the installation of a municipal electric-light plant was carried.

BARABOO, WIS.—Steps have been taken by the Baraboo Commercial Club toward the installation of a new street-lighting system. The Baraboo Gas & El. Co. will soon begin work on rebuilding the street-lighting system.

NEW RICHMOND, WIS.—As soon as the weather permits the New Richmond Pwr. Co. will begin work on the construction of a new hydroelectric power plant, to be located on the John McClure farm, on Apple River, about a mile below its Huntington plant. The initial installation will provide for 300 hp. A transmission line will be erected from the Huntington plant to furnish electricity for use in connection with the construction of the new dam, which will be about 500 ft. long.

FRASER MILLS, B. C., CAN.—The Canadian Western Lumber Co., of New Westminster, will install a large power plant at Fraser Mills to supply electricity for its works. The equipment will include a General Electric low-pressure turbine and alternating-current generator.

NELSON, B. C., CAN.—The British Columbia Tel. Co. contemplates the erection of a telephone line to Kaslo from the terminus of its present line along the western arm, to equip an exchange at Kaslo and to provide service for the intermediate districts, provided sufficient subscribers can be secured to warrant the undertaking.

NEW WESTMINSTER, B. C., CAN.—The city authorities of New Westminster have entered into a contract with the British Columbia El. Ry. Co. for furnishing electricity to operate the municipal electric-light system, covering a period of 11 years from Jan. 1, 1913. The company is to deliver the energy at its local substation at 2300 volts for 1.25 cents per kw-hr. The company is also to furnish switchboards, regulators, transformers, etc., and also bear the operating expenses of the substation. The city agrees to take a minimum of 2,500,000 kw-hr.

SWAN RIVER, MAN., CAN.—The citizens of Swan River are considering the question of developing the water-power of Swan River near the town of Swan River, where it is estimated that about 1000 hp could be developed, at a cost of about $49,000. The citizens have submitted a

proposition to Hon. C. H. Campbell, a Cabinet minister, asking that the government guarantee bonds to the amount of $49,000 to finance the project.

MONCTON, N. B., CAN.—The Intercolonial Ry. Co. is planning to install a telephone system for dispatching trains. The first section is to be installed between St. John and Moncton.

SYDNEY, N. S., CAN.—The Cape Breton El. Co., Ltd., will construct during the coming summer a substation for distributing energy for street-railway use at a point on its Glace Bay division known as Reserve Junction. This substation will be equipped with two 250-kw step-down transformers furnishing energy at 2200-volt, two-phase, 60-cycle to a 300-kw motor generator set. A 10-mile 22,000-volt, three-phase transmission line will be erected from the Sydney power station to the above substation. To supply this line an additional bank, consisting of two 250-kw, 2200-volt two-phase to 22,000-volt three-phase transformers will be installed. The last-named transformers will operate in parallel with a bank now supplying 22,000-volt current for the present transmission line to Sydney. Included in the above work will be the necessary switching equipment in both the Sydney power station and the Reserve substation. E. L. Milliken is manager.

COBALT, ONT., CAN.—The Northern Ontario Lt. & Pwr. Co., Ltd., has formally taken over the entire property of the British Canadian Pwr. Co., Ltd., of Cobalt.

FORT FRANCES, ONT., CAN.—The date for receiving tenders for the construction of the Fort Frances municipal telephone system has been extended from Feb. 1 to March 1. J. W. Walker is clerk.

ORANGEVILLE, ONT., CAN.—The Pine River Lt. & Pwr. Co. is erecting a hydroelectric power plant on Pine River to develop 900 hp. The company owns and operates electric plants in Orangeville and Shelburne and expects to extend its service to Dundalk when the new plant is completed. Energy will be furnished for power purposes when the dam is completed. The equipment will consist of two Lombard waterwheels operating under a head of 138 ft., Canadian Westinghouse generators, switchboards, transformers, etc. Substations will be erected in Orangeville, Shelburne and probably Dundalk. Thomas R. Huxtable is engineer in charge. F. H. Kilbourne, of Owen Sound, is treasurer.

TORONTO, ONT., CAN.—Plans are being considered to extend the transmission lines of the Ontario Hydro-Electric Power Commission to Strathroy, Glencoe, Mount Brydges, Longwood and Melbourne to supply electricity in those places.

AMQUI, QUE., CAN.—Plans are being prepared for the installation of a municipal electric-light plant in Amqui. The proposed plant will be operated by water-power and about 500 hp developed at a cost of about $70,000. J. A. Brilliant, of Amqui, is engineer in charge.

GRAND-MERE, QUE., CAN.—Announcement is made that the H. E. Talbot Co., of Sault Ste. Marie, Ont., has been awarded the contract for the construction of a 1500-ft. dam and complete hydroelectric power plant at Grand-Mère. The contract involves an expenditure of $1,500 000. Interests financing the project are closely allied with the Laurentide Paper Co.

New Industrial Companies

THE ACME ELECTRIC AUTO WORKS, of Los Angeles, Cal., has been incorporated with a capital stock of $10,000 by F. W. Jackman, E. E. Mason and F. C. Morgan.

THE ALPHA DISPLAY COMPANY, of New York, N. Y., has been incorporated with a capital stock of $25,000 by William Koebel, William G. Moir and George W. Schurer, 255 West 108th Street, New York, N. Y. The company proposes to do an electrical advertising business.

THE GEORGE C. CARNWRIGHT COMPANY, of Grand Rapids, Mich., has been incorporated with a capital stock of $8,000 to manufacture gas and electric-light fixtures. The officers are: George C. Carnwright, president; E. V. Carnwright, vice-president, and O. T. Rumsey, secretary and treasurer.

THE CHESAPEAKE ENGINEERING & EQUIPMENT CORPORATION, of Baltimore, Md., has been chartered with a capital stock of $25,000. The company proposes to promote central electric companies and to act as engineer and deal in electrical machinery and supplies. N. B. Hodskin is president and treasurer; E. D. Ford, of Chicago, Ill., vice-president, and L. W. Lake, secretary.

THE CHICAGO INTERLOCKING RAILWAY & JOINT TRUSS COMPANY, of Chicago, Ill., has been incorporated with a capital stock of $150,000 to manufacture railway supplies. The incorporators are: W. C. McDowell, O. Treulich and A. Umenhofer, of Chicago, Ill.

THE EAGLE GAS & ELECTRIC FIXTURE COMPANY, INC., of New York, N. Y., has been incorporated with a capital stock of $10,000 by Emanuel Chanin, William Chepakoff and Adolph Warshow, 1538 Minford Place, New York, N. Y.

THE ELECTRIC BILLBOARD COMPANY, of Charleston, W. Va., has been incorporated with a capital stock of $10,000 to manufacture electrical machinery, etc. The incorporators are: F. W. Hughes, B. Silman, C. E. Carney and others.

THE ELECTRIC SCREEN COMPANY, of San José, Cal., has been incorporated with a capital stock of $20,000 by C. H. Waterman, S. H. Shelly, G. D. Pratt, H. R. Fry and A. W. Johnson.

THE ELECTRIC SHOP, of Newark, N. J., has filed articles of incorporation with a capital stock of $10,000 to do a commercial business. The incorporators are: Roy M. Thomas, William B. Goodspeed and James McEwan.

THE ELECTRO STATIC COMPANY, of Los Angeles, Cal., has been incorporated with a capital stock of $10,000 by R. E. King, C. C. Cooper and F. C. Toney.

THE FALKENBACH MANUFACTURING COMPANY, of the borough of the Bronx, New York, N. Y., has been incorporated with a capital stock of $30,000 to manufacture gas and electric-lighting fixtures. The incorporators are: E. Falkenbach, A. B. Traber and A. Traber, of New York, N. Y.

THE IRON PRODUCTS COMPANY, of Providence, R. I., has been incorporated with a capital stock of $100,000 by Charles M. Nichols, of Taunton; Elmer O. Goordman and Samuel C. Cook, of Providence, R. I. The company proposes to manufacture and deal in and install transmission machinery and other devices, including power machinery.

New Incorporations

DOVER, DEL.—The Kotelai Falls Pwr. Co. has been incorporated with a capital stock of $11,000,000 by Herbert E. Latter, W. J. Maloney and Norman T. Coffman, of Wilmington. The company proposes to generate and distribute electricity.

LEWISTOWN, ILL.—The Lewistown El. Co. has been incorporated with a capital stock of $5,000 to generate and distribute electricity and to manufacture and deal in electrical appliances. The incorporators are: H. C. Hall, William L. Hall and C. V. Smith.

PARIS, KY.—The United States Utilities Co. has been incorporated with a capital stock of $10,000,000 for the purpose of taking over the electric-light plants at Paris and Danville, Ky., and gas plant at Paris. The main office of the company is in St. Louis, Mo.

ROCHESTER, MINN.—The Zumbro Pwr. Co. has been incorporated with a capital stock of $500,000 by Henry O. Christensen and John M. Norton, both of Rochester, and Louis P. Wolff, of St. Paul. The company proposes to develop the water-power of Zumbro Falls and furnish electricity in Rochester and other towns and cities in Minnesota.

TULSA, OKLA.—The Tulsa City Lt., Ht. & Pwr. Co. has been incorporated with a capital stock of $3,000 by A. A. Small, A. B. Davis and G. B. Small.

PHILADELPHIA, PA.—The Springfield El. Co. has been granted a charter with a capital stock of $5,000. W. T. Robinson, 22 South Third Street, Philadelphia, is interested in the company.

WALTERBORO, S. C.—The Walterboro Ice & Lt. Co. has been chartered with a capital stock of $12,000 to establish an ice plant with 10 to 20 tons capacity; also to install an electric light and power plant within two years. The machinery has been purchased. G. C. Brown will be secretary and treasurer and John D. Glover manager.

BREMOND, TEX.—The Bremond El. Lt. Co. has been incorporated with a capital stock of $10,000 by S. M. Peters, J. K. Cayce and C. W. Brown.

FREDERICKSBURG, TEX.—The Fredericksburg El. Co. has been granted a charter with a capital stock of $10,000. The incorporators are: Max H. Beckman, J. L. Nuetwig and Ferdinand Beckman.

MARCUS, WASH.—The Marcus & Kettle Valley Tel. Co. has been incorporated with a capital stock of $15,000.

VANCOUVER, B. C., CAN.—The Bridge River Pwr. Co., Ltd., has been incorporated with a capital stock of $2,000,000 to do a general lighting and power business.

Trade Publications

ELECTRIC SIGNS.—The Federal Sign System (Electric), Chicago, Ill., in its Bulletin No. 172 makes brief reference to its new prismatic electric signs.

ELECTRICAL SPECIALTIES.—The McGill Manufacturing Company, Valparaiso, Ind., has issued its 1913 catalog, in which its complete line of lamp guards, portables and other electrical specialties are illustrated and described. The "Loxon" lamp guard is conspicuously referred to.

BALL-BEARING HANGERS.—A small eight-page folder has been issued by the Hess-Bright Manufacturing Company, Philadelphia, Pa., giving a brief description and specifications of its ball-bearing hangers. Power savings and lubricant savings by the use of ball-bearing hangers are briefly referred to.

MOTORS.—"Fractional-Horse-Power Motors and Their Application" is the subject of Bulletin No. 1146 published by the Fort Wayne Electric Works of the General Electric Company. The applications of small electric motors have so greatly increased in industrial and domestic lines that their uses are almost unlimited. In the present bulletin are shown a number of Fort Wayne motors in actual service.

ELEVATORS.—The Gurney Elevator Company, 62 West Forty-fifth Street, New York, has issued Bulletin No. 4, which relates to its traction elevators, designed for high-speed elevator service. A comprehensive, illustrated description of this type of elevator is given. Bulletin No. 5 is the engineering supplement to Bulletin No. 4.

CONVEYING MACHINERY.—The C. W. Hunt Company, West New Brighton, N. Y., is distributing Catalog No. 12-9, referring to its noiseless bucket conveyor. Within its sixty-four pages are described a number of prominent and interesting installations in which this type of apparatus is used for handling coal, ashes and other material.

BOILER-ROOM ACCESSORIES.—G. L. Simonds & Company, 64 East Van Buren Street, Chicago, Ill., in a sixteen-page catalog, size 4 in. by 9 in., describe and illustrate their testing apparatus for boilers, which includes gas analysis instruments, differential draft gages, soot cleaners for water-tube boilers, boiler-tube cleaners, check and pump valves, smoke indicators and a tube extractor. A list of some water-tube and return-tubular installations made by this company includes a number in electric-light and street-railway stations.

Business Notes

THE WILLIS ELECTRIC METER COMPANY, of Chicago, Ill., has opened a downtown office at 19 South La Salle Street. Mr. W. W. Schwebs is manager.

THE ELECTRICAL MACHINERY SALES COMPANY of Chicago is now located in its new quarters, 1536 Monadnock Building. This company represents in Chicago the Peerless Electric Company of Warren, Ohio, manufacturer of dynamos and motors. It also handles controllers, rheostats and fans.

MR. R. S. MUELLER, 423 High Avenue, S.E., Cleveland, Ohio, has recently secured the agency for the Anchor Webbing Company, Woonsocket, R. I., manufacturer of linen tapes and sleevings and will represent that company in the State of Ohio and in the eastern parts of Indiana and Michigan.

THE DIAMOND RUBBER COMPANY OF NEW YORK, a subsidiary company of the B. F. Goodrich Company, Akron, Ohio, has appointed Mr. W. E. Hardy, formerly manager of the Diamond mechanical branch at New York City, sales manager of the mechanical rubber-goods department, succeeding Mr. I. R. Bailey.

TERRY STEAM TURBINE COMPANY.—Mr. Norman L. Snow has been appointed general sales manager of the Terry Steam Turbine Company, with headquarters at the home office in Hartford, Conn. The New York district office, at 90 West Street, New York City, will continue under the management of Mr. Frederick D. Herbert.

W. N. MATTHEWS & BROTHER, St. Louis, Mo., announce the reassociation with their organization of Mr. John L. Fay, who has been connected with The Milwaukee Railway & Light Company for almost a year past. Mr. Fay, as sales manager of the Matthews company, will have his headquarters at St. Louis. He is an expert on overhead distribution and is thoroughly familiar with the devices and apparatus used in such work. Mr. Louis E. Sperry, who represented the firm in San Francisco, will now have the entire State of California as his territory, owing to the resignation of Mr. Benjamin C. Chase, whose headquarters were formerly at Los Angeles.

THE CARSTARPHEN ELECTRIC COMPANY, of Denver, Col., recently suffered a serious loss through the caving in of its building at Colfax Street and Broadway, caused by partial dismantling of the structure to prepare the civic center site. The Carstarphen company was to have moved to its new building at 1330 Broadway within the week. Suits will probably be instituted against the city and the wrecking company responsible for the heavy damage which was sustained by the manufacturing plant and miscellaneous stock. Fortunately the settling of floors and walls was noted soon enough to enable all occupants of the building to escape.

THE TERRY STEAM TURBINE COMPANY in recent extensions of its organization has appointed Messrs. Robinson, Cary & Sands, of St. Paul, Northwestern agents, covering the territory of Minnesota and North and South Dakota. In addition to the agencies already established at Toronto and Montreal, the territory included in Manitoba, Alberta and Saskatchewan, Canada, will be represented by the Refrigerating & Engineering Company, Ltd., of Somerset Block, Winnipeg. After the middle of the month the general sales office of the Terry company will be removed to the works at Hartford, Conn., and will be under the direction of Mr. Norman L. Snow. Mr. Frederick D. Herbert will continue in charge of the New York office.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED FEB. 4, 1913.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York.]

1,051,894. SPECIAL-CALL TELEPHONE SYSTEM; A. E. Keith, Hinsdale, Ill. App. filed May 2, 1911. Semi-automatic with rotary calling devices.

1,051,929. MECHANISM FOR OPERATING DISTANT CIRCUIT-BREAKERS; C. S. Van Nuis and J. W. Achard, Philadelphia, Pa. App. filed Feb. 18, 1907. Motor-driven mechanism for storage-battery system.

1,051,940. SYSTEM OF ELECTRICAL DISTRIBUTION; J. L. Woodbridge, Philadelphia, Pa. App. filed April 19, 1904. Regulation by a "floating" battery.

1,051,941. MEANS FOR RECTIFYING ALTERNATING CURRENTS; J. L. Woodbridge, Philadelphia, Pa. App. filed Nov. 29, 1909. Variable-pressure resistance device synchronized.

1,051,942. OUTLET BOX; A. I. Appleton, Chicago, Ill. App. filed Aug. 21, 1909. Connections between sectional units.

1,051,944. WOOL-WASHING AND DEGREASING MACHINE; J. Baudot, Tourcoing, France. App. filed Feb. 6, 1911. The liquid is electrolyzed outside of the washing tank.

1,051,946. FIRE-ALARM BOX; C. F. Burroughs, East Orange, N. J. App. filed April 12, 1912. Protected self-winding mechanism.

1,051,949. ELECTRICAL SYSTEM OF DISTRIBUTION; L. H. Flanders, Jenkintown, Pa. App. filed Feb. 23, 1911. Storage-battery generator regulation.

1,051,967. ELECTRIC HEATER; A. W. Person, Harvard, Neb. App. filed March 11, 1912. Heater elements are arranged in grooves.

1,051,979. AUTOMATIC CONTROL VALVE FOR WATER HEATERS; J. M. Appleton, Lodi, Cal. App. filed April 16, 1912. Electric switch operated by the flow of water.

1,051,984. PROCESS FOR EXTRACTING IODINE, CHLORINE, POTASSIUM HYDROXIDE AND OTHER USEFUL PRODUCTS FROM THE ASH OF SEAWEEDS OR OTHER MARINE FORMS OF ALGÆ; F. K. Cameron, Washington, D. C. App. filed Dec. 26, 1911. Electrolysis; dedicated to the public.

1,051,989. HARMONIC PARTY-LINE TELEPHONE RINGER; C. J. Erickson, Chicago, Ill. App. filed Aug. 11, 1906. Striker support.

1,051,991. AUTOMATIC CUT-OFF FOR ELECTRIC WATER HEATERS; C. C., R. C. and J. W. Fine, Nanticoke, Pa. App. filed March 5, 1912. Thermostatic device carried by the cover.

1,052,001. SELF-ACTING RESISTANCE FOR ELECTRIC MOTORS; M. Kallmann (deceased), Berlin, Germany. App. filed Nov. 16, 1906. Plurality of independent parallel-connected sections.

1,052,030. ELECTRIC WELDING SYSTEM; J. Beckmann, Alameda, Cal. App. filed June 8, 1911. Automatic shut-off.

1,052,044. ELECTRICAL APPLIANCE; T. Deaderick, Nashville, Tenn. App. filed Feb. 27, 1912. Locking a lamp bulb in its socket.

1,052,056. OPERATION OF TRANSLATING DEVICES WITH MULTIPLE ELECTRODES; P. C. Hewitt, New York, N. Y. App. filed May 23, 1903. Balancing the emfs in two paths.

1,052,057. VAPOR ELECTRIC DEVICE; P. C. Hewitt, New York, N. Y. App. filed July 24, 1905. Starting by tilting the container.

1,052,065. METHOD OF REGENERATING ELECTRIC GLOW LAMPS; E. A. Kruger, Seehausen, Germany. App. filed Aug. 30, 1911. Inserting a new filament and heating.

1,052,089. IGNITER; L. V. Raulet, Detroit, Mich. App. filed June 3, 1912. Spark ignition of gas stoves.

1,052,097. ELECTRICALLY HEATED COMB; E. Schwartz, Chicago, Ill. App. filed Aug. 15, 1912. Proportioned to prevent over-heating.

1,052,119. UNIVERSAL ELECTRIC INDUCTION HEATING AND COOKING ELEMENT; J. L. Anderson, Ogden, Utah. App. filed Oct. 30, 1911. Transformer for a griddle or sadiron.

1,052,162. SANITARY TELEPHONE MOUTHPIECE; J. McCausland, Providence, R. I. App. filed May 8, 1912. Detachable paper cone.

1,052,184. ELECTRIC ALARM AND SIGNAL FOR AIR BRAKES; I. B. Snapp, Clifton Forge, Va. App. filed Dec. 4, 1911. The condition of the brakes is indicated in the cab.

1,052,202. REFILLABLE FUSE CARTRIDGE; G. W. Appler, Lyons, N. Y. App. filed Oct. 5, 1912. Removable end caps.

1,052,219. AUTOMATIC TELEGRAPHY; P. B. Delany, South Orange, N. J. App. filed Dec. 29, 1908. Chemical recorder.

1,052,232. GAS-LIGHTING VALVE; C. W. Francis, Omaha, Neb. App. filed April 11, 1912. Spark ignition for motor-vehicle lights.

1,052,256. ELECTROLYSIS OF METAL SALT SOLUTIONS; N. V. Hybinette, Christiansand, Norway. App. filed Jan. 5, 1912. Fibrous filtering material supported by lead.

1,052,263. ELECTRICALLY PROPELLED MOTOR CARS; F. G. Liljenroth, Vesteras, Sweden. App. filed April 8, 1912. Special winding of electric motor in a gas-engine motor-generator system.

1,052,268. CURRENT-COLLECTING MEANS FOR SIGNAL APPARATUS OR THE LIKE; E. L. Nicholson, Lakewood, Ohio. App. filed June 10, 1909. Third-rail shoe support.

1,052,285. SIGNAL FOR ELEVATORS; M. C. Schwab, Chicago, Ill. App. filed Dec. 8, 1910. Touch signal in the controller handle.

1,052,330. PRIMARY BATTERY; G. S. Engle, Providence, R. I. App. filed Dec. 4, 1908. Carbon, zinc and alkaline electrolyte.

1,052,354. ELECTRIC BELL; A. Lüngen, New York, N. Y. App. filed Dec. 4, 1909. Sheet-metal frame; inclosed type.

1,052,389. ANNUNCIATOR AND SIGNAL SYSTEM; W. Tribble, Alton, Ill. App. filed Dec. 23, 1909. For setting a series of call numbers.

1,052,409. SWITCH-OPERATING MECHANISM; H. W. Cheney, Milwaukee, Wis. App. filed April 3, 1909. Separable connection for a circuit-breaker.

1,052,425. ARC LAMP; W. R. Ridings, Manchester, England. App. filed Oct. 5, 1912. Magazine type with inclined carbons; feed device.

1,052,427. OPERATING CONTACT FOR AUTOMATIC PIANO-PLAYERS; E. B. Sherman, Chicago, Ill. App. filed Jan. 10, 1910. "Tri-point" for coin-controlled instrument.

1,052,443. TELEPHONE-RECEIVER HOLDER; A. Orzechowski, Stamford, Conn. App. filed Jan. 24, 1912. For holding the receiver when off the hook.